FIREBERD® 300/500

WAN Analyzer User's Guide

TTC™
A Dynatech Company

50-14041-01

FIREBERD 300/500
WAN ANALYZER

USER'S GUIDE

DECEMBER 1994

Rev. A

©1994 Telecommunications Techniques Corporation®
20400 Observation Drive
Germantown, Maryland 20876
(800) 638-2049 or (301) 353-1550 (MD)
FAX (301) 353-0731

Specifications, terms, and conditions are subject to change without notice.

TABLE OF CONTENTS

SECTION 1 OVERVIEW 1-1
1.1 WAN Analyzer User's Guide Summary 1-1
1.2 About The WAN Analyzer 1-1
1.2.1 Features and Characteristics 1-3
1.3 What's Next? 1-3
1.3.1 Pointing and Clicking 1-4

SECTION 2 GETTING STARTED WITH THE WAN ANALYZER 2-1
2.1 Section Summary 2-1
2.2 Getting Started With The WAN Analyzer 2-1
2.2.1 The First Step — Selecting a Test Type 2-2
2.2.2 The Second Step — Entering the WAN Analyzer 2-3
2.2.3 The Third Step — Setting Up to Capture Data 2-5
2.2.4 The Fourth Step — Configuring Ports 2-8
2.3 A Preview Of How The WAN Analyzer Works 2-11
2.4 What's Next? 2-13

SECTION 3 THE MAIN MENU — THE WAN ANALYZER CORE 3-1
3.1 Section Summary 3-1
3.2 The Purpose Of The Main Menu 3-1
3.3 What You Can Do In The Main Menu 3-2
3.4 Selecting A WAN Analyzer Task 3-2
3.4.1 Displaying Open Tasks by Title (Cascading Windows) 3-6
3.4.2 Viewing Open Tasks Simultaneously (Tiling Windows) 3-7
3.4.3 Closing One or More Tasks 3-8
3.5 Starting And Stopping A Test 3-8
3.6 Saving The WAN Analyzer Configurations 3-8
3.6.1 Saving a New Configuration to a File 3-9
3.6.2 Changing a Configuration and Saving it Under the Original File Name 3-10
3.6.3 Changing a Configuration and Saving it Under it Under a New File Name 3-10
3.6.4 Opening a Previously Saved Configuration 3-11
3.6.5 Saving Captured Data to a File 3-11
3.6.6 Entering Information About a Configuration (The User Information Note pad) 3-12
3.7 Print Options 3-12
3.8 Displaying Or Hiding The Information Line 3-15
3.9 Toolbar Icons 3-16
3.9.1 Displaying or Hiding the Toolbar Icons 3-16
3.10 Starting A New Test 3-17
3.11 Returning To The Test Manager 3-19

SECTION 4 CAPTURE — THE WAN ANALYZER EVENT FILTER 4-1
4.1 Section Summary 4-1
4.2 Capture Overview 4-1
4.2.1 The Capture Task and the Capture Mode Setup Dialog Box 4-1
4.2.2 Before Setting Filters 4-2
4.3 Entering The Capture Task 4-2
4.3.1 If the Capture Task Cannot be Selected 4-3
4.4 What You Can Do In The Capture Task 4-4
4.5 How The Capture Task Works 4-6
4.5.1 Event Filters 4-7
4.5.2 The AND Gate 4-8
4.5.3 The Actions Box 4-10
4.6 Setting Filters On Frame Events 4-13
4.6.1 Setting a New Frame Filter 4-13
4.6.2 Contents Matching 4-14
4.6.3 Displaying the Current Frame and Contents Filters 4-20
4.7 Setting Filters On Lead Or Signal Transitions 4-21
4.7.1 Setting a New Lead or Signal Filter 4-21
4.7.2 Setting Lead and Status Signal Transitions 4-23
4.7.3 Displaying the Current Lead or Signal Filters 4-25
4.8 Filter Management 4-25
4.8.1 Clearing All Filters 4-25
4.8.2 Clearing Individual Filters 4-26
4.8.3 Changing Individual Filters 4-27
4.9 More Filter Setup Hints 4-28
4.9.1 Passing All Data to the Capture Buffer 4-28
4.9.2 Blocking All Data From Being Sent to the Buffer 4-28
4.9.3 Capturing Pre-and Post-Trigger Data 4-29
4.9.4 Customizing the Appearance of the Capture Screen 4-29
4.10 Capture-Specific Icons 4-30
4.11 What's Next? 4-31
4.11.1 After Setting Filters 4-31

SECTION 5 DISPLAY — THE WAN ANALYZER PROTOCOL DECODER 5-1
5.1 Section Summary 5-1
5.2 Display Task Overview 5-1
5.2.1 Before Running the Display Task 5-1
5.2.2 What You Can Do in the Display Task 5-2
5.3 Entering The Display Task 5-2
5.3.1 If the Display Task Cannot Be Selected 5-3
5.3.2 The Browse and Real Time Sections 5-3
5.3.3 Adjusting the Display Screens 5-4
5.3.4 Opening a Second Display Screen 5-4
5.3.5 Viewing the Display: 1 and Display: 2 Screens Simultaneously 5-4

5.4 Using The Real-Time And Browse Windows 5-5
5.4.1 Displaying Frame Events in the Real-Time Window 5-5
5.4.2 Browsing Frames While a Test is in Progress (Freeze Buffer) 5-6
5.4.3 Displaying Captured Frames at the End of a Test 5-9
5.5 Protocol Decodes 5-10
5.5.1 Selecting Protocol Decodes 5-10
5.5.2 Applying Post-Capture Filtering 5-11
5.6 Time Deltas 5-14
5.7 Choosing A Display Format 5-15
5.8 Moving Through The Browse Window 5-18
5.8.1 Moving to the Top of the Browse window 5-18
5.8.2 Moving to the End of the Browse Window 5-18
5.8.3 Scrolling Up Through the Browse window 5-18
5.8.4 Scrolling Down Through the Browse Window 5-18
5.8.5 Moving to a Specific Frame in the Browse Window 5-13
5.9 Display-Specific Icons 5-19
5.10 Protocol Decode Suites 5-21
5.10.1 TCP/IP Protocol Decode Suite 5-21
5.10.2 AppleTalk Protocol Decode Suite 5-22
5.10.3 Decnet Protocol Decode Suite 5-23
5.10.4 Banyan VINES Protocol Decode Suite 5-23
5.10.5 Novell Netware Protocol Decode Suite 5-24
5.10.6 Xerox Network System (XNS) Protocol Decode Suite 5-24
5.10.7 ISO Protocol Decode Suite 5-25
5.10.8 IBM Systems Network Architecture (SNA) Protocol Decode Suite 5-26
5.10.9 COM Protocol Decode Suite 5-26
5.10.10 IBM PC LAN Protocol Decode Suite 5-26
5.10.11 Sun Network File System (NFS) Protocol Decode Suite 5-26
5.10.12 Local Area Network (LAN) Protocol Decode Suite 5-27
5.10.13 Frame Relay Protocol Decode Suite 5-27
5.10.14 Integrated Services Digital Network (ISDN) Protocol Decode Suite 5-27
5.10.15 Switched Multi-Megabit Data Service (SMDS) Protocol Decode Suite 5-28
5.10.16 Systems Network Architecture (SNA) Protocol Decode Suite 5-28
5.10.17 X.25 Protocol Decode Suite 5-29
5.10.18 Link Layer Protocols 5-29
5.10.19 ATM Protocol Decode Suite 5-29

SECTION 6 THE STATISTICS TASK 6-1
6.1 Section Summary 6-1
6.2 Statistics Task Overview 6-1
6.2.1 What You Can Do in the Statistics Tasks 6-1
6.2.2 Available Statistics 6-2
6.2.3 How Link Utilization Statistics are Collected 6-5
6.2.4 When Statistics are Collected 6-5
6.3 Entering The Statistics Task 6-6

6.3.1 If the Statistics Task Cannot be Selected 6-6
6.3.2 The Two Sections of the Statistics Screen 6-7
6.3.3 Adjusting the Statistics Screens 6-7
6.3.4 Opening a Second Statistics Screen 6-8
6.3.5 Viewing the Statistics 1 and Statistics 2 Screens Simultaneously 6-8
6.4 Selecting A Source Of Statistics 6-8
6.5 Displaying Statistics In A Tabular Format 6-9
6.5.1 Getting Started 6-10
6.5.2 Setting Up the Tabular Display 6-10
6.5.3 Choosing a Font for the Tabular Display 6-20
6.5.4 Choosing a Grid Color for the Tabular Display 6-21
6.6 Displaying Statistics In A Graphical Format 6-22
6.6.1 Getting Started 6-22
6.6.2 Setting Up the Graphical Display 6-23
6.6.3 Choosing Colors for the Graphical Display 6-33
6.7 Logging Statistics To A File 6-35
6.7.1 The Logging Options Dialog Box 6-35
6.7.2 Enabling Logging 6-37
6.8 Collecting Statistics 6-37
6.8.1 Starting the Collection of Statistics Immediately 6-38
6.8.2 Starting the Collection of Statistics on a Trigger 6-38
6.8.3 Freezing the Graphical and Tabular Displays 6-39
6.8.4 Resetting Statistics to Zero Totals/Values 6-39
6.8.5 Stepping Forward Through a Log File 6-40
6.8.6 Stepping Forward Through a Log File 6-40
6.8.7 Obtaining a Hard Copy of the Tabular and/or Graphical Display 6-41
6.9 Statistics-Specific Icons 6-42

SECTION 7 THE TRAFFIC GENERATION TASK 7-1
7.1 Section Summary 7-1
7.2 An Overview Of Traffic Generation 7-1
7.2.1 What You Can Do in the Traffic Generation Task 7-1
7.2.2 Traffic Generation vs Emulation 7-2
7.3 T1/Data Access Requirements For Traffic Generation 7-2
7.4 Entering the Traffic Generation Task 7-3
7.4.1 If the Traffic Generation Task Cannot be Selected 7-4
7.5 Building Frames For Traffic Generation 7-4
7.5.1 Entering the Frame Builder Dialog Box 7-5
7.5.2 Basic Rules for Building Frames 7-5
7.5.3 The Components of the Frame Builder Dialog Box 7-6
7.6 Setting a Transmit Interval 7-6
7.7 Generating Traffic 7-7
7.8 General Procedure for Generating Traffic 7-10
7.9 Traffic Generation Hints 7-11
7.9.1 Tiling the Display of Statistics Task 7-11

7.9.2 Saving the Current Traffic Generation Configuration to a File 7-12
7.10 Traffic Generation Icons 7-12

SECTION 8 ISDN AND FRAME RELAY EMULATION 8-1
8.1 Section Summary 8-1
8.2 An Overview Of Emulation 8-1
8.3 Access Requirements For Emulation 8-2
8.3.1 T1/Data Access Requirements for Emulation 8-2
8.3.2 WAN Port Configuration Requirements for Emulation 8-2
8.4 Entering The Emulation Task 8-3
8.4.1 If the Emulation Task Cannot be Selected 8-4
8.5 ISDN Emulation 8-5
8.5.1 What You Can Do in the ISDN Emulation Task 8-5
8.5.2 When Entering the ISDN Emulation Task 8-6
8.5.3 Configuring the WAN Analyzer for ISDN Emulation 8-8
8.5.4 Starting and Stopping ISDN Emulation 8-11
8.5.5 Initiating or Accepting a Call 8-11
8.5.6 Initiating an Auto-Call 8-12
8.5.7 Terminating an Established Connection or Rejecting an Incoming Call 8-13
8.5.8 Restarting the Interface 8-13
8.5.9 Sending and In-Service Message 8-13
8.5.10 Sending a Maintenance Message
8.5.11 Sending an Out-of-Service Message 8-14
8.5.12 Sending a TEI Audit 8-14
8.5.13 General Procedure for ISDN Primary Rate Emulation 8-15
8.5.14 ISDN Emulation Icons 8-16
8.6 Frame Relay Emulation 8-17
8.6.1 What You Can Do in the Frame Relay Emulation Task 8-17
8.6.2 When Entering the Frame Relay Emulation Task 8-17
8.6.3 Configuring the WAN Analyzer for Frame Relay Emulation 8-18
8.6.4 Opening and Displaying PVCs 8-20
8.6.5 Building Frames 8-22
8.6.6 Starting and Stopping Frame Relay Emulation 8-26
8.6.7 Resetting Statistics 8-26
8.6.8 Transmitting a Frame 8-27
8.6.9 General Procedure for Frame Relay Emulation 8-27
8.6.10 Frame Relay Emulation Icons 8-29

FIGURES

2-1 Test Type Choices 2-2
2-2 WAN Initial Configuration Dialog Box 2-4
2-3 The Capture Mode Setup Dialog Box 2-3
2-4 The WAN Port Configuration Dialog Box 2-8
2-5 The WAN Analyzer's Main Menu 2-11
3-1 The WAN Analyzer Main Menu Screen 3-1

3-2 Displaying All Open Task Managers By Title Bar 3-6
3-3 Displaying All Open Tasks Simultaneously 3-7
3-4 The Save As Dialog Box 3-9
3-5 The Print/Report Dialog Box 3-13
3-6 No Default Printer Message 3-14
3-7 The Information Line Displayed 3-15
3-8 The Toolbar Enabled 3-17
3-9 The WAN Initial Configuration Screen 3-18
4-1 The Opening Capture Screen 4-3
4-2 The Three Parts Of All Filter Set-Up Dialog Boxes 4-6
4-3 Example: Event Filters Selected With No AND Gate Choices Checked 4-8
4-4 Example: Event Filters Selected With AND Gate Choices 4-9
4-5 Starting Capture 4-11
4-6 Stopping Capture 4-12
4-7 Sample Contents Match Dialog Box 4-17
4-8 Sample Address Offset 4-19
4-9 Displaying The Current Content Filters 4-21
4-10 Data Configuration Screen With Data WAN Protocol And V.35 Interface Selected 4-22
4-11 Sample Filter Dialog Box With V.35 Lead State Transitions 4-22
4-12 T1 Signal Status Transitions 4-23
4-13 Sample Lead Transitions (RS-232 Interface) 4-23
4-14 Sample Lead Transitions Screen 4-24
4-15 Warning Message When Clearing All Filters On Port A 4-26
4-16 The Font Dialog Box 4-30
5-1 Entering The Display Screen 5-3
5-2 The Freeze Buffer Enabled 5-7
5-3 The Freeze Buffer Dialog Box 5-9
5-4 The Stack Setup Dialog Box 5-10
5-5 Generic Frame Relay Decodes 5-11
5-6 The Generic Frame Relay Stack Template 5-13
5-7 The 802.4 Dialog Box 5-13
5-8 The Display Format Dialog Box 5-15
5-9 The Expanded Display Format 5-16
5-10 The Compressed Display Format 5-16
5-11 The ASCII Display Format 5-17
5-12 The Hex Display Format 5-17
6-1 Entering The Statistics Screen 6-6
6-2 Adjusting The Screen So Only The Graphical Display Is Visible 6-8
6-3 Sample Tabular Display 6-10
6-4 The Tabular Display Setup Dialog Box 6-11
6-5 Choosing The Statistics To Include In The Tabular Display 6-12
6-6 Choosing The Statistics To Remove From The Tabular Display 6-13
6-7 Inserting A Heading 6-15
6-8 The Tabular Display Options Dialog Box 6-16
6-9 Sample Tabular Display Setup Dialog Box 6-18

6-10 Sample Tabular Display Options Dialog Box 6-19
6-11 Resulting Tabular Display 6-19
6-12 The Font Dialog Box 6-20
6-13 The Color Dialog Box 6-21
6-14 Sample Graphical Display 6-22
6-15 The Graphical Display Setup Dialog Box 6-23
6-16 Choosing The Statistics For The Graphical Display 6-25
6-17 Removing A Statistic(s) From The Graphical Display 6-26
6-18 The Graphical Display Options Dialog Box 6-27
6-19 Flat Bar Graph 6-28
6-20 3-D Bar Graph 6-28
6-21 Flat Line Graph 6-29
6-22 3-D Line Graph 6-29
6-23 Sample Graphical Display Setup Dialog Box 6-31
6-24 Sample Graphical Display Options Dialog Box 6-31
6-25 The Resulting Graphical Display (Before Statistics Are Enabled) 6-32
6-26 The Resulting Graphical Display (After Statistics Are Enabled) 6-32
6-27 The Graph Colors Dialog Box 6-33
6-28 The Color Dialog Box 6-34
6-29 The Logging Options Dialog Box 6-35
6-30 Log File Message 6-30
6-31 The Reset Statistics Dialog Box 6-40
6-32 The Print Statistics Dialog Box 6-41
7-1 Sample Frame Builder Dialog Box 7-5
7-2 The Set Transmit Interval Dialog Box 7-2
7-3 The Traffic Generator Dialog Box 7-9
7-4 Traffic Generator Message 7-10
8-1 The WAN Port Configuration Dialog Box 8-3
8-2 The ISDN Screen 8-6
8-3 The ISDN Primary Rate Dialog Box 8-8
8-4 The Frame Relay Screen 8-17
8-5 The Frame Relay Emulation Dialog Box 8-19
8-6 The PVC Selection Dialog Box 8-21
8-7 Sample Frame Relay Frame Builder Dialog Box 8-21

TABLES

1-1 FIREBERD 300/500 Mainframe WAN Capabilities 1-1
2-1 Capture Mode Setup Choices 2-6
2-2 WAN Port Configuration Choices 2-9
2-3 WAN Analyzer Task Summary 2-12
3-1 Selecting a WAN Analyzer Task 3-3
3-2 Status and Action Selections Available 3-4
4-1 Actions Box Choices 4-10
4-2 The Components Of The Contents Matching Dialog Box 4-16

5-1 Post-Capture Filtering Choices (802.4) 5-14
6-1 Source Option Choices 6-9
6-2 Tabular Display Setup Choices 6-11
6-3 Graphical Display Setup Choices 6-24
6-4 Logging Options Choices 6-36
7-1 T1/Data Access Requirements For Traffic Generation 7-2
7-2 The Components Of The Frame Builder Dialog Box 7-6
7-3 The Components Of The Traffic Generator Dialog Box 7-9
8-1 T1/Data Access Requirements For Emulation 8-2
8-2 WAN Port Configuration Requirements For Emulation 8-3
8-3 ISDN Primary Rate Status Information 8-7
8-4 ISDN Primary Rate Dialog Box Choices 8-9
8-5 Frame Relay Emulation Dialog Box Choices 8-19
8-6 PVC Selection Dialog Box Choices 8-21
8-7 The Components Of The Frame Relay Frame Builder Dialog Box 8-24

SECTION 1
OVERVIEW

1.1 WAN ANALYZER USER'S GUIDE SUMMARY

This guide is designed for all users of the FIREBERD 300/500 WAN Analyzer (henceforth called the WAN Analyzer). It describes the WAN Analyzer's features and capabilities, and especially emphasizes its major components and how you use them.

Note that this guide does not provide comprehensive information about WAN technologies and standards (e.g., Frame Relay, ISDN, the Open Systems Interconnection (OSI) seven-layer stack, etc.); as such, it assumes prior experience with the technologies and standards you are testing.

1.2 ABOUT THE WAN ANALYZER

The WAN Analyzer is a Windows™-based instrument that gives you detailed data on the operational status of wide area network hardware and software. The FIREBERD 300/500 mainframe configuration determines the WAN capabilities. Table 1-1 lists the WAN Analyzer options and capabilities.

Table 1-1
FIREBERD 300/500 Mainframe WAN Capabilities

Mainframe/Option:	Capabilities:
FB300	
FB330	Single Port WAN Analyzer Module (includes encapsulated LAN analysis software). Provides capture, decode, and statistics on WAN protocols up to 2 Mb/s on full-duplex port.
FB300-2	FIREBERD 300 Mainframe with Protocol option (includes traffic generation capability for all common protocols including: ADDCP/HDLC, SNA/SDLC, X.25/LAPB, DASS2/LAP, PPP, SMDS DXI, and Cisco HDLC) (requires FB330 option).
FB30700	Frame Relay Traffic Generation Software (requires FB300-2 option)
FB30701	Frame Relay Traffic Generation & Emulation Software (requires FB300-2 option)

Table 1-1
FIREBERD 300/500 Mainframe WAN Capabilities (Continued)

Mainframe/Option:	Capabilities:
FB30710	SMDS PLCP/L2/L3-PDU Decode Software
FB30711	SMDS PLCP/L2/L3-PDU Decode & L3- PDU Traffic Generation Software (requires FB300-2 option)
FB30720	ISDN PRI Decode Software
FB30721	ISDN PRI Decode & Traffic Generation Software (requires FB300-2 option)
FB30722	ISDN PRI Decode, Traffic Generation, & Emulation Software (requires FB300-2 option)
FB500	
FB530	Single-port WAN Analyzer Module. Provides capture, decode, statistics, and traffic generation capability for all common protocols (including: ADDCP/HDLC, SNA/SDLC, X.25/LAPB, DASS2/LAP, PPP, SMDS DXI, T1 ATM, and Cisco HDLC) on WAN protocols up to 2 Mb/s on a full-duplex port.
FB531	Dual-port WAN Analyzer Module. Provides capture, decode, statistics, and traffic generation capability for all common protocols (including: ADDCP/HDLC, SNA/SDLC, X.25/LAPB, DASS2/LAP, PPP, SMDS DXI, T1 ATM, and Cisco HDLC) on WAN protocols up to 2 Mb/s on two full-duplex ports.
FB50800	Frame Relay Traffic Generation Software
FB50801	Frame Relay Traffic Generation & Emulation Software
FB50810	SMDS PLCP/L2/L3-PDU Decode Software
FB50811	SMDS PLCP/L2/L3-PDU Decode & L3-PDU Traffic Generation Software
FB50820	ISDN PRI Decode Software
FB50821	ISDN PRI Decode & Traffic Generation Software
FB50822	ISDN PRI Decode, Traffic Generation & Emulation Software
FB50830	Encapsulated LAN Decode Software
FB50840	TAD/FAD Access Software
FB50850	T1 ATM Decode Software
FB50851	T1 ATM Decode & Traffic Generation Software

Depending on the FIREBERD 300/500 mainframe configuration and options installed, you may be able to perform some or all of the following tasks.

- Test new hardware or software before it is installed in a network.

- Troubleshoot existing hardware and software as a means of finding problems in an existing network.
- Analyze traffic for error conditions.

The WAN Analyzer enables you to perform these activities by giving you the ability to:

- Capture, store, and translate packets into plain English so you can study the data that travels across the network.
- Accumulate, display, and log statistics (e.g., link utilization, frame count, etc.) for the WAN protocol you are testing. (Section 6 describes the statistics Tasks in detail.)
- Generate traffic to duplicate frame content and traffic conditions. Traffic generation is very useful when testing new equipment and applications in a lab without disrupting normal network operations. (Section 7 describes this activity in detail.)
- Emulate components of a Frame Relay or ISDN networks (optional). Emulation is an especially effective tool for installation testing, because it allows you to evaluate the performance of new network equipment and detect problems before they can affect live traffic. (Section 8 describes Frame Relay and ISDN emulation in detail.)

1.2.1 Features and Characteristics

The WAN Analyzer has these features and characteristics:

- Dual port environment for totally independent simulation and analysis of all major protocols. Identify problems quickly by comparing information from both sides of internetwork devices.
- Pre-capture triggers and filters that enable you to discard the frame events and/or signaling lead transitions events that are not critical to the test you are running and keep the ones you want to analyze. By capturing on specific events, you can conduct tests more quickly and efficiently than would be possible if you sorted through all the information that passed through the analyzer.
- Post-capture filters that enable you to inhibit the display of frame events you don't want to study and view the ones you want to analyze.
- English language translation of a variety of WAN and LAN-encapsulated protocols.
- Link protocol statistics collection can be displayed in tabular and/or graphic displays.

1.3 WHAT'S NEXT?

Section 2 describes all of the activities that need to be performed at the start of a WAN Analyzer session.

1.3.1 Pointing and Clicking

Beginning in Section 2, there are many references to the Windows convention of *pointing and clicking*. In this manual, please note that, although there are many ways to click on an icon, menu, menu item, or selection:

- *Pointing* is performed using the FIREBERD 300/500 trackball. The trackball is used to position the pointer at a specific place on the display.

- *Clicking* is performed using the FIREBERD 300/500 trackball button. This button is used to select the item or activity to which you are pointing.

Please consult the *FIREBERD 300/500 Internetwork Analyzer User's Guide* for more information about the trackball and trackball buttons.

SECTION 2
GETTING STARTED WITH THE WAN ANALYZER

2.1 SECTION SUMMARY

This section of the manual describes the activities to be performed at the start of a WAN Analyzer session. It describes how to:

- Select a test type in the T1/Data Test Module (e.g., Data WAN Protocol or T1 WAN Protocol).
- Enter the WAN Analyzer.
- Specify the way to capture data.
- Configure the WAN Analyzer's ports for the test to be performed.

2.2 GETTING STARTED WITH THE WAN ANALYZER

At the start of any WAN Analyzer session, do the following in sequence:

1. Select a test type in the T1/Data Test Module (e.g., **Data WAN Protocol** or **T1 WAN Protocol**) in the Data Configuration dialog box of the FIREBERD 300/500 T1/Data Test Module (see Section 2.2.1). If **Data WAN Protocol** is selected as a test type, you must also select an interface (e.g., RS-232, V.35, etc.).
2. Enter the WAN Analyzer (see Section 2.2.2).
3. Set up the way you want to capture data — to memory, to disk, or from disk (see Section 2.2.3).
4. Configure one or both ports for the test to be performed (see Section 2.2.4).

The following sections describe each of the four steps in detail.

2.2.1 The First Step — Selecting a Test Type

As the first step in the WAN Analyzer session, you. must select a test interface that is appropriate for the test you want to run. You complete this step using the T1/Data Test Module, which must always be installed in the unit when working with the WAN Analyzer.

To select a test interface, do the following:

1. From the Test Manager, click on the **T1/Data** icon on the toolbar.

   RESULT: If you are starting a new session, the default Data Configuration dialog box appears on the screen.

2. Click on the **Test Type** arrow to open up the choices available in the menu (see Figure 2-1).

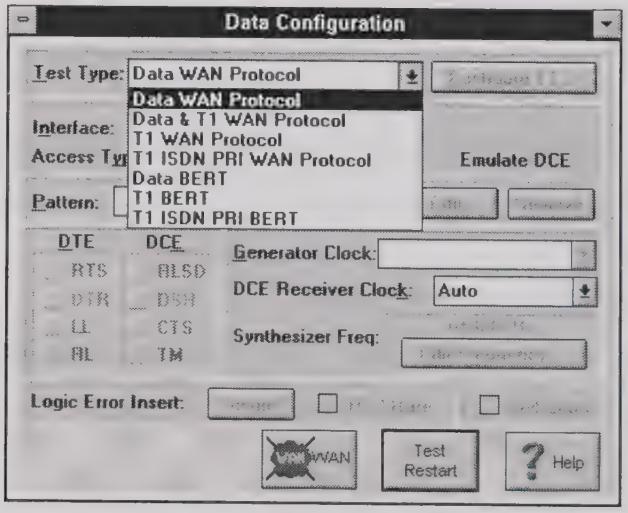


Figure 2-1
Test Type Choices

3. Based on the type of test you want to run, do the following:

Select:	If:
Data WAN Protocol	You want to test WAN protocol on a data interface (i.e., RS-232, V.35, or RS-449). When selecting Data WAN Protocol, the Data Configuration top-level dialog box appears on the screen.
T1 WAN Protocol	You want to test WAN protocol on a T1 interface. When selecting T1 WAN Protocol, the T1 Configuration top-level dialog box appears on the screen.
Data & T1 WAN Protocol	You want to conduct a dual port WAN test on a data interface and T1 interface simultaneously. When making this selection, the Data Configuration top-level dialog box is displayed first.
T1 ISDN PRI WAN Protocol	You want to test WAN protocol on the ISDN primary rate interface. When selecting ISDN PRI WAN Protocol, the T1 Configuration top-level dialog box appears on the screen.

4. Configure the Data Configuration or T1 Configuration top level dialog box (and all sub-level dialog boxes) as appropriate for the test. See the *FIREBERD 300/500 T1/Data User's Guide* for a description of each entry in these dialog boxes.

2.2.2 The Second Step — Entering the WAN Analyzer

After you have completed the configuration of the Data Configuration or T1 Configuration dialog box (and all sub-level dialog boxes that are appropriate for the test), you are ready to enter the WAN Analyzer.

To enter the WAN Analyzer, do the following:

1. Click on the **WAN** button at the bottom of the dialog box. Or if in Test Manager, you can click on the **WAN** icon in the menu bar.

   RESULT: If you are starting a new FIREBERD 300/500 session, the WAN Initial Configuration dialog box appears on the screen (see Figure 2-2). This dialog box indicates that the WAN Analyzer requires configuration.

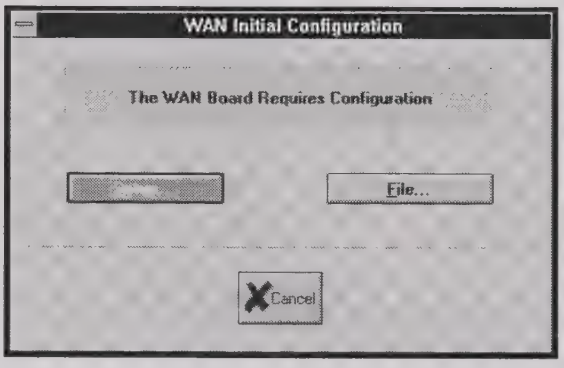


Figure 2-2
WAN Initial Configuration Dialog Box

Click On:	To:
Setup...	Start the initial configuration and display the Capture Mode Setup dialog box on the screen. Section 2.2.3 fully describes the choices in this dialog box.
File...	Recall a WAN test configuration that you have previously stored in a file. Section 3 describes this activity.
Cancel	Cancel the configuration of the WAN Analyzer. When you make this selection, the WAN Analyzer main menu is displayed; however, since the Analyzer is not configured, its functionality is not available to you. At this point, you can click on **Task**, then click on **Setup** to display the dialog boxes that allow you to configure the WAN Analyzer. If desired, you can instead choose to click on **Test Manager** and exit the WAN Analyzer.

Sections 2.2.3 and 2.2.4 describe procedures on how to set up to capture data and how to configure one or both ports for the test you want to run, respectively.

2.2.3 The Third Step — Setting Up to Capture Data

After you have pointed and clicked on the Setup selection in the WAN Initial Configuration dialog box, the Capture mode Setup dialog box is displayed on the screen. You must indicate how you want to capture data. The Capture Mode Setup dialog box (see Figure 2-3) enables you to do this.

The Capture Mode Setup dialog box lets you capture data to memory, to disk, or use data that has already been captured on disk. You also choose whether to enable or disable the capture activity at the start of the test.

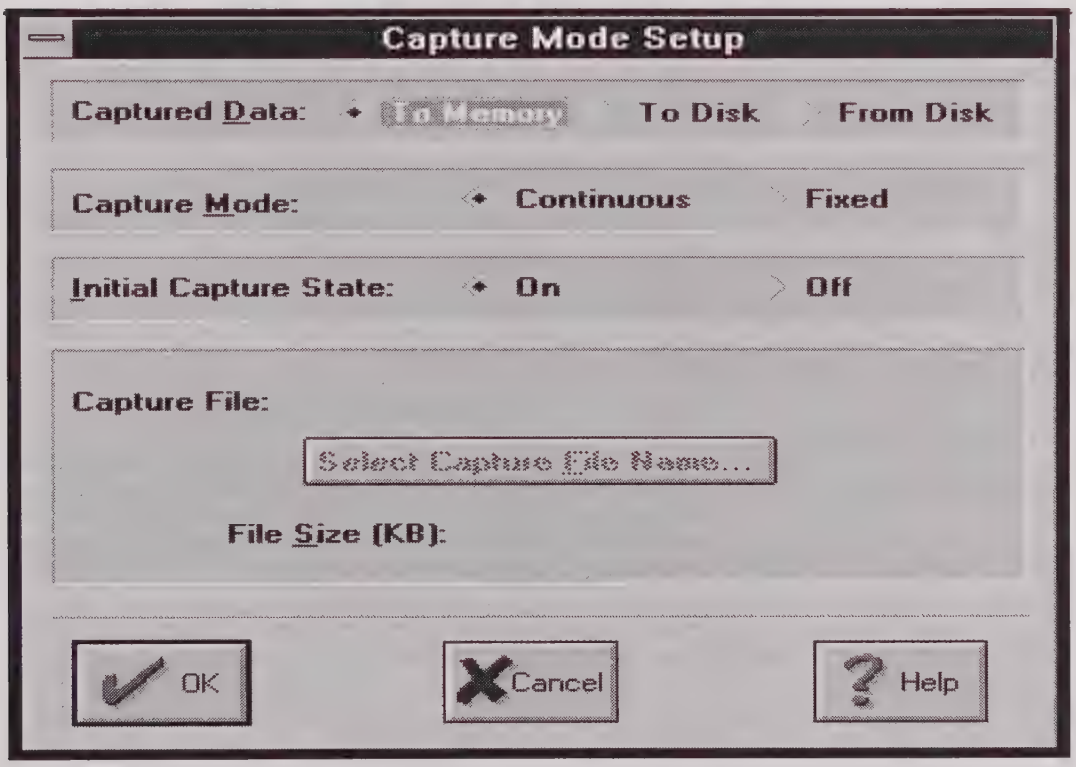


Figure 2-3
The Capture Mode Setup Dialog Box

The choices available in the Capture Mode Setup dialog box are described in Table 2-1.

Table 2-1
Capture Mode Setup Choices

Click On:	When:
To Memory	You want to capture directly to the WAN Analyzer capture buffer memory. TO MEMORY is the fastest way to capture data, but you may be limited by the amount of memory in the buffer; longer traces are normally required for tracking intermittent network problems and obtaining accurate, reliable statistics. When TO MEMORY is selected, the **File Size (KB)** box cannot be used, and the **Select Capture File Name** box is grayed out. **File Size (KB)** applies only when you are capturing data TO DISK; **File Name** applies when you are capturing data TO DISK or FROM DISK.
To Disk	You want to capture data to a file on the hard disk. When you make this selection, you must also do the following: 1. Click on the **Select Capture File Name** box. This displays the Open Capture Data Output File dialog box. 2. In the space provided for the file name, type in the name of the file where data is to be captured, then press the **ENTER** key. The default file extension for trace files is .tra. **RESULT:** The File Size Setup dialog box appears. 3. Enter the size to be allocated for the capture data file size (the default is 256 KB). You must enter a value ≥256 KB, then click on **OK**. This redisplays the Capture Mode Setup dialog with the name of the file specified displayed next to **Capture File**. The limit to the value you can enter is determined by the available disk space. **RESULT:** The Open Capture Data Output File dialog box appears on the display.

Table 2-1
Capture Mode Setup Choices (Continued)

Click On:	When:
From Disk	You want to use data that you've already captured on disk for the test you want to run. When you make this selection, you must also do the following: 1. Click on the **File Name** box. **RESULT:** The Open Capture Data Input File dialog box appears on the display. 2. Type in the file name under which the data is stored on disk, then press the **ENTER** key. **RESULT:** The Capture Mode Setup screen reappears, and the name of the file you specified is displayed next to **Capture File**. When you choose to use data FROM DISK, you cannot gather statistics on that data. Statistics can only be gathered on data captured in real time.
Continuous	You want to continuously capture data to the WAN Analyzer buffer or disk buffer, even after it is filled. When you select Continuous, the data stored at the beginning of the buffer is overwritten with data that you captured most recently. The advantages of choosing Continuous are: • You can be sure you're always working with the most recently captured data. • It's easier to capture and identify intermittent problems in the network. Continuous only applies when you are capturing data TO MEMORY or TO DISK.
Fixed	You want to stop capturing data when the WAN Analyzer buffer or disk buffer is full. FIXED only applies when you are capturing data TO MEMORY or TO DISK.
On	To enable the capture activity at the start of the test. If you select ON, you can STOP data capture while a test is in progress using the Capture Manager's **Setup** box. (Section 4 describes how you do this.)
Off	To disable the capture activity at the start of the test. If you select OFF, you can START data capture while a test is in progress using the Capture Manager's **Setup** box. (Section 4 describes how you do this.)

When you have completed all of the entries in the Capture Mode Setup dialog box, click on **OK** to proceed to the WAN Port Configuration dialog box (described in the following section).

2.2.4 The Fourth Step — Configuring Ports

After specifying how you want to capture data, you must identify how you want the WAN Analyzer port(s) to be configured. The WAN Port Configuration dialog box (see Figure 2-4) enables you to do this. If you are running a new test, this dialog box automatically appears after you exit from the Capture Mode Setup dialog box.

NOTE: Port configuration is required only when you are capturing data TO MEMORY or TO DISK, as indicated in the Capture Mode Setup dialog box. If you are using data that you already captured FROM DISK, the dialog box that you access (as described in Table 2-1) can only be used to view the name of the file and the link protocol in use.

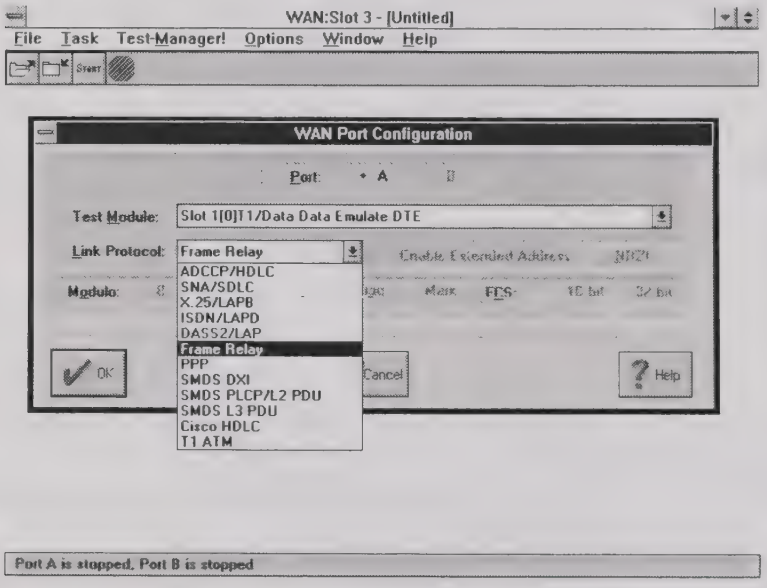


Figure 2-4
The WAN Port Configuration Dialog Box

The choices available in this dialog box are described in Table 2-2.

Table 2-2
WAN Port Configuration Choices

Choose:	To:
Port	Specify the port to configure (A and/or B). If you are running a dual port test, point, click on, and configure Port A, then configure for Port B.
Test Module	Connect the physical level test module. Click on the down arrow to view the choices available to you. The connection choices available to you are directly related to the test type you selected in the T1/Data Test Module. For example, if you selected **T1 WAN Protocol** as the test type, set Access to **Receive Only**, and the T1/Data Test Module is installed in Slot 1 of the FIREBERD 300/500, the following connection choice appears in the window: `Slot 1(0)T1/Data:T1 Monitor Both Lines` where: Slot 1 is the slot the interface is installed in the FIREBERD 300/500. (0) is the interface reference number of the T1/Data Test Module. T1/Data is the module name. T1 is the current physical interface being used in the T1/Data Test module. Monitor is the Access selection. Both Lines shows the number of lines currently in use.
Link Protocol	Choose the link level protocol to use during the test from the following list: ADCCP/HDLC SNA/SDLC X.25/LAPB ISDN/LAPD Frame Relay PPP SMDS DXI SMDS PLCP/L2 PDU*

Table 2-2
WAN Port Configuration Choices (Continued)

Choose:	To:
	SMDS L3 PDU* Cisco HDLC T1 ATM * Available only when Access (on T1/Data Configuration menu) is set to Monitor
Enable Extended Address	Specify that ADCCP/HDLC data link address is of indefinite length (using the ADCCP/HDLC address extension mechanism) when the box is checked. When the box is not checked, the address is one byte in length. **NOTE:** The Enable Extended Address selection applies only when you specify ADCCP/HDLC as the link protocol. Otherwise, it is grayed out.
Modulo	Select Modulo 8 or Modulo 128, as appropriate for the test. **NOTE:** The Modulo selection applies only when you specify ADCCP/HDLC, SNA/SDLC, ISDN/LAPD, or X.25/LAPB as the link protocol. Otherwise, it is grayed out.
Idle Fill	Choose **Flag** to fill idle channel time with flags. (Flags are special bit sequences that always appear at frame boundaries.) Choose **Mark** to fill idle channel time with marks (i.e., ONES). **NOTE:** Idle Fill applies only when you specify ADCCP/HDLC or SNA/SDLC as the link protocol. Otherwise it is grayed out.
FCS	Select 16-bit or 32-bit Frame Check Sequence (FCS), as appropriate for the test. **NOTE:** 32-bit FCS applies only when you specify ADCCP or DXI as the link protocol. Otherwise it is grayed out.
NRZI	Select Non-Return to Zero Inversion as appropriate for the test. **NOTE:** NRZI applies only when you specify SNA/SDLC as the link protocol and the T1/Data Test Module Access Type is set to Monitor, Emulate DTE, or Emulate DCE. Otherwise, it is grayed out.

After you have correctly configured the port(s), click on **OK**. The WAN Analyzer main menu is displayed on the screen (see Figure 2-5), which indicates you have completed the entry process and are ready to select a task.

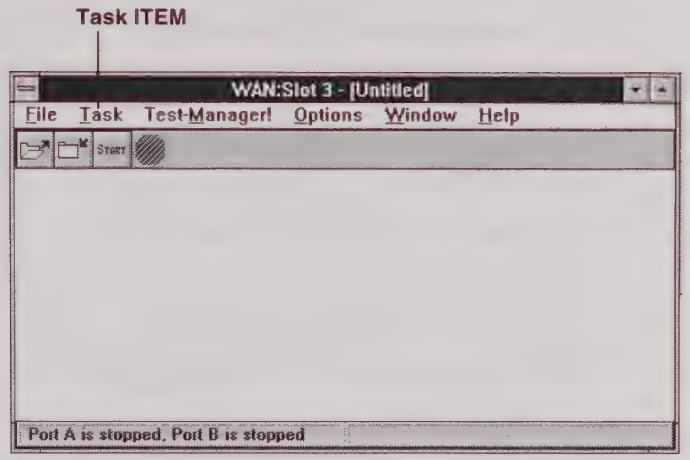


Figure 2-5
The WAN Analyzer's Main Menu

2.3 A PREVIEW OF HOW THE WAN ANALYZER WORKS

Once you've entered the WAN Analyzer, it is important to understand that the key to its operation are the Tasks you can select in the main menu. Each task enables you to control a specific activity that is involved for WAN testing.

To view the Tasks you can perform with the WAN Analyzer:

1. Click on the **Task** item on the main menu bar.

   RESULT: The names of the Tasks that are available to you are displayed in the menu box.

Table 2-3 lists the WAN Analyzer Tasks briefly describes the activity controlled and where you can obtain more information about it.

Table 2-3
WAN Analyzer Task Summary

The:	Lets You Do the Following:	To Learn More:
Setup Selection	Set up the way in which you want to capture data.	See Section 2.2.3.
	Configure ports for the test you want to perform.	See Section 2.2.4.
	The line below SETUP in the Task menu indicates that the activities in this area must be completed before the other Task managers become available.	
Capture Task	Select the events you want to capture and analyze. Capture enables you to store the events that are important to the test and eliminate those that do not apply.	See Section 4.
Display Task	View English language translation of WAN and WAN-encapsulated protocols.	See Section 5.
	Set up high-level filtering.	
	Display any frame that passes current filtering conditions.	
	Calculate time deltas between two frames.	
Statistics Task	Accumulate, display, and log statistics on the protocol you are testing (e.g., link usage, frame count, etc.).	See Section 6.
	View data in a tabular format, a graphical format, or both formats at the same time.	
Traffic Generation Task	Generate traffic for all link protocols (e.g., ADCCP/HDLC, Frame Relay, etc.).	See Section 7.

Table 2-3
WAN Analyzer Task Summary (Continued)

The:	Lets You Do the Following:	To Learn More:
Start or Stop Selection	Start or stop the WAN Analyzer, respectively.	
Emulation Task	Emulate Frame Relay or ISDN. Emulation is only available as a selection when ISDN/LAPD or Frame Relay is selected as the link protocol on the WAN Port Configuration dialog box.	See Section 8.

2.4 WHAT'S NEXT?

Section 3 describes the activities associated with the WAN Analyzer Main Menu.

SECTION 3
THE MAIN MENU — THE WAN ANALYZER CORE

3.1 SECTION SUMMARY

This section gives you information about the WAN Analyzer Main Menu. It describes the following:

- The primary purpose of the main menu.
- The activities it manages.

3.2 THE PURPOSE OF THE MAIN MENU

The main menu (see Figure 3-1) can be perceived as the core of the WAN Analyzer. As such, it enables you to access and move between:

- The various activities associated with the WAN Analyzer.
- The other modules installed in the FIREBERD 300/500.

The main menu also enables you to save any WAN Analyzer configuration to a file so you can recall it for future use. This feature saves time for tests that you run repeatedly, because it enables the task managers to be configured automatically. By saving a configuration to a file the first time, it eliminates the need to set up each parameter of the test individually when you run the test again.

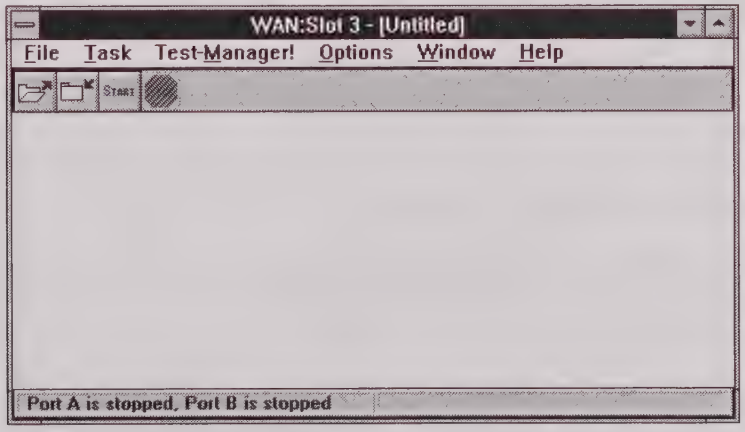


Figure 3-1
The WAN Analyzer Main Menu Screen

3.3 WHAT YOU CAN DO IN THE MAIN MENU

Using the WAN Analyzer Main Menu, you can do all of the following:

1. Select a WAN Analyzer Task (e.g., Display, Capture, Statistics, etc.).
2. Start or stop a WAN Analyzer test.
3. Return to the Test Manager allowing you to access the T1/Data or LAN Test Module, or end the FIREBERD 300/500 session.
4. Control the display of the Toolbar (the gray bar below the Menu bar) and the information line (the gray bar at the bottom left corner of the screen).
5. Arrange all OPEN task managers so each one is entirely visible.
6. Arrange all OPEN task managers so only each title bar is visible.
7. Save the current WAN Analyzer configuration to a file for future use.
8. Store an already-saved WAN Analyzer configuration under a new file name.
9. Save data that you capture during a test to a file.
10. Print the contents of the USER INFO notepad.
11. Print the current port configuration.
12. Print the analysis results.
13. Start a new test by reconfiguring the WAN Analyzer.

Each of these activities is described in the following sections.

3.4 SELECTING A WAN ANALYZER TASK

After you have configured the ports and entered the WAN Analyzer Main Menu, you have the ability to select one of the WAN Analyzer's primary tasks from the Task menu.

To select a WAN Analyzer task, follow the instructions in Table 3-1.

Table 3-1
Selecting a WAN Analyzer Task

Step:	Activity:	
1.	Click on **Task** on the menu bar.	
	RESULT:	The names of the tasks that are available to you are displayed in the drop-down menu.
2.	**Click On:**	**When You Want To:**
	Capture	Select the events you want to capture and analyze. Capture enables you to store the events that are important to the test and filter out those that do not apply. Although this task is not required, it is recommended that you complete it prior to running the test. Section 4 describes the Capture Task.
	Display	View English language translation of WAN and encapsulated LAN protocols while the test is in progress. Set up high-level (post-capture) filtering. Display any frame that passes current filtering conditions. Calculate time deltas between two frames. Section 5 describes the Display Task.
	Statistics	Accumulate, display, and log statistics on the protocol you are testing (e.g., link usage, frame count, etc.). View data in a tabular format, a graphical format, or both formats at the same time. Choose ports or a log file as the source of statistics. Section 6 describes the Statistics Task.

Table 3-1
Selecting a WAN Analyzer Task (Continued)

Step:	Activity:	
2. (con't)	Emulation	Emulate Frame Relay or ISDN. Emulation is only available as a selection when ISDN/LAPD or Frame Relay is selected as the link protocol in the WAN Port Configuration dialog box. It is grayed out when Access (on T1/Data Configuration menu) is set to Receive Only or Monitor. Section 7 describes the Emulation Task.
	Traffic Generation	Generate traffic for all link protocols. It is grayed out when Access (on T1/Data Configuration menu) is set to Receive Only or Monitor. Section 8 describes the Traffic Generation Task.

When you choose any of the tasks listed in Table 3-1, the following two additional selections appear on the main menu.

- **Setup**
- **Actions**

The Task selection determines the selections available for the Setup and Actions menu selections, as shown in Table 3-2.

Table 3-2
Status and Action Selections Available

Task:	Setup:	Actions:
Capture	New frame Filter… New Lead filter… Mode: Use filters Mode: Block all Configuration… Display font…	Edit filters… Display content filters Display Lead filters Clear all filters Select Port A (B)

Table 3-2
Status and Action Selections Available (Continued)

Task:	Setup:	Actions:
Display	Stack setup… Display realtime Time deltas Display format… Freeze buffer… Colors…	Browse freeze buffer Browse capture buffer Home End Previous frame Next frame Goto frame… Set anchor frame… Print data…
Statistics	Source… Tabular display… Graphical display… Logging… Tabular font… Tabular grid color… Graph colors…	Enable collection Trigger collection Disable collection Freeze Step Reset… Print
Emulation	Frame Relay Link… Frame Builder…	Run Halt PVC Selection… Reset Status… Frame Tx
Traffic Generation	Frame Builder… Txmit Interval…	

More than one task can be open at any given time. The following sections describe how you can display multiple tasks on the screen.

3.4.1 Displaying Open Tasks By Title (Cascading Windows)

When you choose to have more than one task open at one time, you can arrange them so that each of their title bars can be viewed on the screen. In Figure 3-2 for example, the Display and Statistics Tasks are both open, and have their title bars visible.

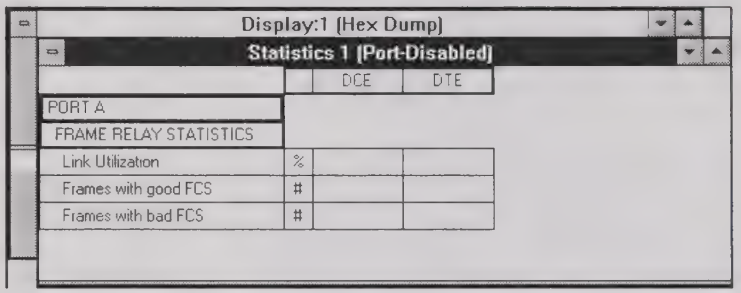


Figure 3-2
Displaying All Open Task Managers by Title Bar

To arrange the open tasks by title, do the following:

1. Click on the **Window** menu selection.

   RESULT: The **Window** menu choices are displayed on the screen.

2. Click on **Cascade**.

   RESULT: The open Tasks are arranged as shown in Figure 3-2.

The task that is prominent on the screen is the one that is considered to be active. To activate any non-prominent task in the cascade, simply click on any part of the box that is exposed.

3.4.2 Viewing Open Tasks Simultaneously (Tiling Windows)

When you have more than one task open at the same time, you can divide the screen so that they can be viewed simultaneously. In Figure 3-3, for example, the Display and Statistics Tasks are both open, and are both visible on a single display.

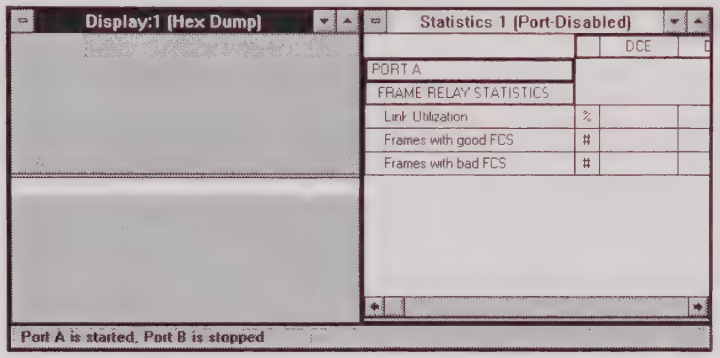


Figure 3-3
Displaying All Open Tasks Simultaneously

To view the open tasks simultaneously, do the following:

1. Click on the **Window** menu selection.

   RESULT: The **Window** menu choices are displayed on the screen.

2. Click on **Tile**.

   RESULT: The open Tasks are all visible, as shown in Figure 3-3.

The task with its title bar highlighted in blue is the one that is considered current. To make any other task current, simply click on any area of that task.

3.4.3 Closing One or More Tasks

You can also use the **Window** menu to close all the open tasks. To do this:

1. Click on the **Window** menu.
2. Click on **Close All**.

To close a single task, do the following:

1. Click on the menu box, which is the bar located in the upper left corner of the task you want to close.
2. Select **Close** from the open menu.

3.5 STARTING AND STOPPING A TEST

After you have opened and configured the Tasks for the test you want to run, you can use the main menu to start the test by clicking on the START icon, or by doing the following.

1. Click on the **Task** menu.
2. Click on **Start**.

After you start the test, you can monitor data in the Display Task, and, if available, view statistics on the data in the Statistics Task. See Sections 5 and 6 for a complete description of these activities, respectively.

When you are ready to stop the test, you can click on the STOP icon, or by doing the following.

1. Click on the **Task** menu.
2. Click on **Stop**.

3.6 SAVING THE WAN ANALYZER CONFIGURATIONS

Through Windows, you have the ability to save any WAN Analyzer configuration (i.e., test set-up) to a file and recall it for future use. If you plan on performing a specific test repeatedly, this feature is highly recommended, because, by saving the configuration to a file, you'll only need to configure the WAN Analyzer the first time you run that test.

When saving a configuration to a file in the WAN Analyzer, only the current WAN Analyzer menu and task settings are stored — the T1/Data Test Module is not affected. As such, if the WAN configuration you are recalling also requires a change to the T1/Data test module, change the T1/Data module before recalling the WAN configuration. For example, if the WAN Analyzer configuration includes a connection to a T1 interface, and the current T1/Data test type is **Data WAN Protocol**:

1. Reenter the T1/Data Test Module and change the test type to T1 WAN Protocol.

2. Enter the WAN Analyzer and recall the previously stored configuration.

3.6.1 Saving a New Configuration To a File

If you want to save the current WAN Analyzer configuration to a file so it can be recalled for future use, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **Save Test Setup As**.

   RESULT: The **Save As** dialog box is displayed on the screen (see Figure 3-4).

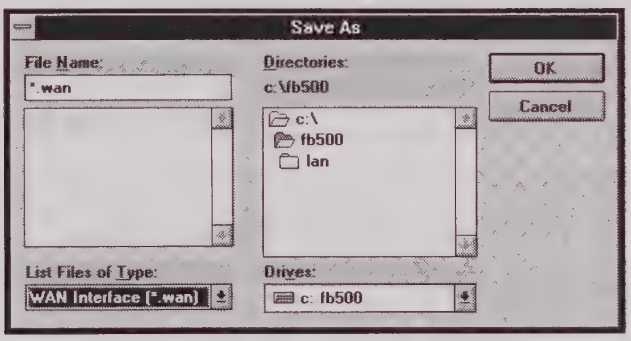


Figure 3-4
The Save As Dialog Box

3. Ensure that the directory currently open is the one in which you want to save the configuration. If it is not, open the appropriate directory by pointing and clicking on it.

4. In the **File Name** area, type the name under which you want the configuration to be stored, then press the **ENTER** key. (WAN configurations use the default **.wan** file extension so you can identify them quickly.)

   RESULT: The configuration is stored under the file name and directory you specified. The file can be recalled at any time by entering the **File** menu and clicking on **Open Test Setup**.

3.6.2 Changing a Configuration and Saving it Under the Original File Name

If you have opened a previously saved configuration, have changed it during the session, and you want to save it under its original file name, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **Save Test Setup**.

   RESULT: The updated configuration is saved under the original file name. If you have not opened a previously saved configuration, the **Save As** dialog box appears on the screen; in such instances, follow Steps 3 and 4 of the procedures described in Section 3.6.1.

3.6.3 Changing a Configuration and Saving it Under a New File Name

If you have changed an existing configuration, and want to save it under a new file name, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **Save Test Setup As**.

   RESULT: The **Save As** dialog box is displayed on the screen.

3. Be sure the directory currently open is the one you want to save the test configuration under. If it is not, open the appropriate directory.

4. In the **File Name** area, type the name under which you want the test configuration to be stored, then press the **ENTER** key.

   RESULT: The configuration is stored under the file name you entered. The file can be recalled at any time by entering the **File** menu and clicking on **Open Test Setup**.

3.6.4 Opening a Previously Saved Configuration

To open a WAN Analyzer configuration that you have already saved to a file, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **Open Test Setup**.

   RESULT: The **Open** dialog box is displayed on the screen.

3. Be sure the directory currently open is the one you want to save the test configuration under. If it is not, open the appropriate directory.

4. Click on the file name you want to open, then press the **ENTER** key.

   RESULT: The settings stored in the file you opened are automatically applied to the WAN Analyzer, and you are returned to the main menu.

   NOTE: When you open a WAN Analyzer configuration, these settings override any previous WAN configurations specified in the Test Manager. (Remember that any configuration activities in Test Manager affect ALL modules in the FIREBERD 300/500.) This also provides an automatic startup of the following WAN application features: Start/Stop the WAN task, enable/disable Statistics, run/halt Emulation, and restores the display.

3.6.5 Saving Captured Data to a File

When you have completed the test (by clicking on **Stop** in the **Task** menu), you can, if desired, save any data captured in the WAN Analyzer buffer to a file. To do this, perform the following steps:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **Save Captured Data**.

   RESULT: The **Save As** dialog box is displayed on the screen.

3. Be sure the directory currently open is the one you want to save the captured data under. If it is not, open the appropriate directory.

4. In the File Name area, type the name under which you want the captured data to be stored, then press the **ENTER** key.

   RESULT: The data that you captured is stored under the file name you entered.

3.6.6 Entering Information About a Configuration (The User Information Notepad)

The User Information Notepad enables you to enter information about the current WAN Analyzer configuration (e.g., when the configuration should be used, test hints, etc.). The information you supply appears with the file name when you:

1. Click on **Open Test Setup** to display the **Open** menu.
2. Click on **Find File**.

To use the notepad, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **User Info**.

   RESULT: The User Information dialog box is displayed on the screen.

3. Enter the desired description in the notepad, which may be up to 4000 characters in length.
4. Click on **OK** when the description is complete.

3.7 PRINT OPTIONS

In the main menu, you have the following print options:

- Print the contents of the User Information Notepad.
- Print the current port configuration.
- Print the analysis results that you have accumulated during the test.

If desired, you can select all items in a single print request. When you do so, the contents of the User Information Notepad, the current port configuration, and the statistics are printed on individual pages.

To print the contents of the User Information Notepad, port configuration, or statistics, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **Print/Report**.

   RESULT: The Print/Report dialog box is displayed on the screen (see Figure 3-5).

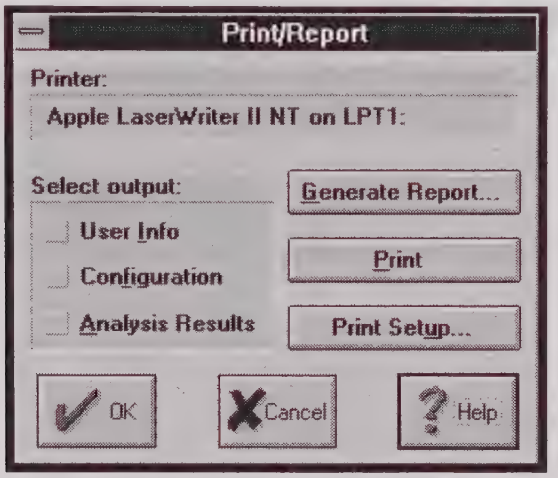


Figure 3-5
The Print/Report Dialog Box

3. To print the contents of the User Information Notepad, click on **User Info**; to print the current port configuration, click on **Configuration**; to print statistics, click on **Analysis Results**. When selected, a check mark appears in each box.

4. Click on **Print Setup**.

   RESULT: The Print Setup dialog box appears on the display. This dialog box lets you select the default printer or a specific printer as the device you want to use, the orientation of the paper, plus the size and source of the paper you are using. If desired, you can also access a variety of printer options.

5. Select the default printer or a device from the list of specific printers as the printer for this job. If a default printer has not been specified, you will receive the message shown in Figure 3-6.

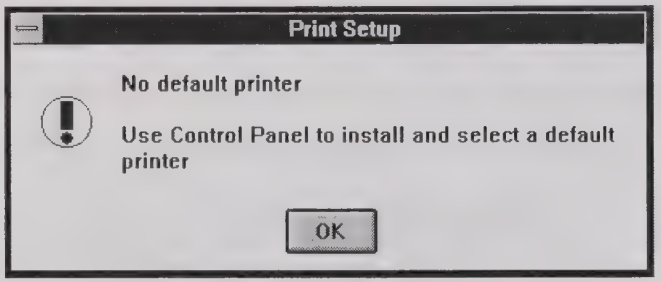


Figure 3-6
No Default Printer Message

If you receive this message, you can specify a default printer by:

a. Exiting the WAN Analyzer.

b. Entering the Windows Program Manager.

c. Opening up the main menu.

d. Pointing and clicking on **Control Panel**.

e. Pointing and clicking on **Printers**.

f. Once the Printers screen is displayed, pointing and clicking on the printer in the Installed Printers list that you want to use as the default.

g. Returning to the WAN Analyzer and repeating Steps 1-5 of this procedure.

6. After you successfully enter the Print Setup screen in the WAN Analyzer, click on **Options** if you want to change any of the optional print parameters. Please consult the Windows documentation or Windows on-line help for detailed information about these options.

7. When you have set up the printer, return to the Print/Report dialog box and click on **Print** to start the job.

3.8 DISPLAYING OR HIDING THE INFORMATION LINE

The information line briefly summarizes the current main menu selection. For example, if you click and hold on the **Test Manager** selection, the information line (which always appears in the lower left corner of the window) reads Switch To Test Manager.

To turn the information line on or off, do the following:

1. Click on the **Options** menu.

   RESULT: The **Options** menu choices (**Toolbar** and **Information line**) appear on the screen.

   A check mark next to **Information line** indicates it is currently displayed (see Figure 3-7); the absence of a check mark indicates it is not displayed.

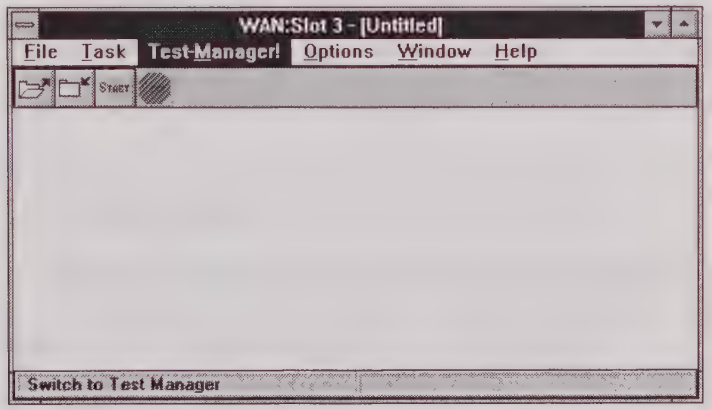


Figure 3-7
The Information Line Displayed

2. To set the information line to its opposite condition, simply click on **Information line**.

3.9 TOOLBAR ICONS

Located directly below the menu selection, the toolbar displays a series of icons that are actually shortcuts to selecting certain activities.

Assume, for example, you want to open a configuration file. You could select this activity using the WAN Analyzer Main Menu — and that would involve two steps:

1. Pointing and clicking on the **File** menu.
2. Selecting **Open Test Setup**.

However, instead of using two steps to open a configuration file, you can also do the following:

1. Click on the "open folder" icon (arrow pointing up).

Thus, if an icon is available for a menu activity, it can save you an extra step in the selection process.

When no tasks are open, the main menu icons that are available for use are as follows:

Open Folder	Open a configuration file. When you click on this icon, the **Open** dialog box is displayed on the screen (see Section 3.6.4). Selecting this icon is equivalent to clicking on the **File** menu and selecting **Open Test Setup**.
Closed Folder	Save a new WAN Analyzer configuration file. When you click on this icon, the **Save As** dialog box is displayed on the screen (see Section 3.6.1). Selecting this icon is equivalent to clicking on the **File** menu and selecting **Save Test Setup** or **Save Test Setup As**.
Start	Start the WAN board. Selecting this icon is equivalent to clicking on the **Task** menu and selecting **Start**.
Stop	Stop the WAN board. Selecting this icon is equivalent to clicking on the **Task** menu and selecting **Stop**.

NOTE: Additional toolbar icons are available for each of the active tasks. See the appropriate section for the toolbar icons that are available for Capture, Display, Statistics, Emulation, and Traffic Generation.

Displaying or Hiding the Toolbar Icons

To turn the toolbar on or off, do the following:

1. Click on the **Options** menu.

   RESULT: The **Options** menu choices (**Toolbar** and **Information Line**) are displayed on the screen.

   A check mark next to **Toolbar** indicates that it is currently displayed (see Figure 3-8); the absence of a check mark indicates that it is not displayed.

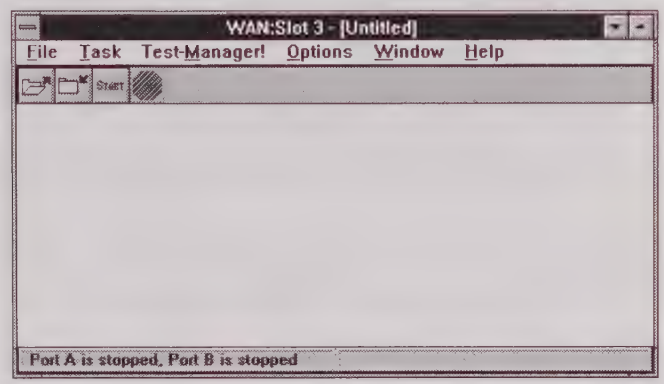


Figure 3-8
The Toolbar Enabled

2. To set the toolbar to its opposite condition (enabled or disabled), simply click on **Toolbar**.

3.10 STARTING A NEW TEST

Whenever the WAN Analyzer is not gathering information (i.e., running a test), you can, if desired, reconfigure it and start a new test.

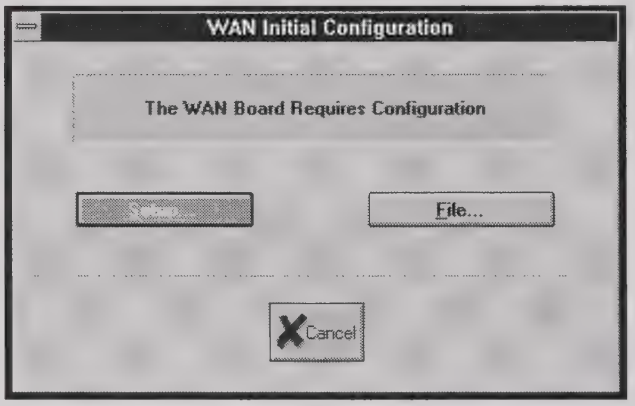
To reconfigure the Analyzer and start a new test, do the following:

1. Click on the **File** menu.

   RESULT: The **File** menu choices are displayed on the screen.

2. Click on **New Test**.

RESULT: The WAN Initial Configuration dialog box appears on the screen (see Figure 3-9). This dialog box serves to inform you that the WAN Analyzer requires configura-



tion.

Figure 3-9
The WAN Initial Configuration Screen

3. Click on **Setup** to start the reconfiguration and display the Capture Mode Setup dialog box (see Figure 2-3) followed by the WAN Port Configuration dialog box (refer to Figure 2-4), which are described in sections 2.2.3 and 2.2.4, respectively.

   or:

   Click on **File** to recall a WAN test configuration you have stored in a file. Section 3.6.4 fully describes this activity.

Remember that since you're not leaving the WAN Analyzer during this procedure, NEW TEST should only be used if you don't need to change or reconfigure the physical level interface for the new test you want to run. If a change or reconfiguration of this nature is required, do the following:

1. Click on the **Test Manager** selection on the WAN Analyzer Main Menu.

   RESULT: The **FIREBERD Test Manager** appears on the display.

2. Click on the **T1/Data** icon.

   RESULT: The current top-level configuration (T1 Configuration or Data Configuration) dialog box appears in the display.

3. Select a new test type and reconfigure the physical level interface as required.

4. When you have completed the reconfiguration, click on the **WAN** icon to reenter the WAN Analyzer.

3.11 RETURNING TO THE TEST MANAGER

After you have completed the WAN Analyzer session, you may want to return to the Test Manager, where you can enter another test module or exit the FIREBERD 300/500. To do this, click on the **Test-Manager** main menu selection.

SECTION 4
CAPTURE — THE WAN ANALYZER EVENT FILTER

4.1 SECTION SUMMARY

This section of the manual gives you detailed information about the WAN Analyzer Capture Task. It describes the following:

- Why you capture data.
- The activities associated with the Capture Task.
- How you can perform these activities.

4.2 CAPTURE OVERVIEW

The Capture Task is the WAN Analyzer's primary data filter. Simply put, it enables you to:

- Discard events that are not critical to the test you are about to run, and capture the ones you want to analyze.
- Trigger the starting or stopping of the Capture Task on specific frame or signaling events.

By saving specific events, you can conduct tests more quickly and efficiently than would be possible if you sorted through all the information that passed through the WAN Analyzer.

NOTE: The WAN Analyzer offers post-capture filter capability in its Display Task. Section 5 fully describes this capability.

It is important to understand that setting the capture filters is not a required activity for WAN Analyzer testing. However, if you choose not to set these filters, it means that all the information that passes through the WAN Analyzer will be captured, including data you may not be interested in studying.

4.2.1 The Capture Task and the Capture Mode Setup Dialog Box

The Capture Task works in tandem with the Capture Mode Setup dialog box to control the way information is filtered and captured, respectively.

Where the Capture Task primarily lets you specify how you want data to be filtered, the Capture Mode Setup dialog box lets you specify where you want data to be captured. Using this dialog box, you can choose to capture data to memory or disk, capture data continuously or at a fixed interval, and turn the capture activity on or off at the beginning of the test. (Section 2.2.3 describes the Capture Mode Setup dialog box.)

4.2.2 Before Setting Filters ...

Generally, it is recommended that you have done all of the following in sequence before setting filters:

1. Selected a physical layer test type using the FIREBERD 300/500 T1/Data Test Module (see Section 2.2.1).
2. Entered the WAN Analyzer Main Menu (see Section 2.2.2).
3. Configured the capture data method using the Capture Mode Setup dialog box (see Section 2.2.3).
4. Configured one or both ports (see Section 2.2.4).

4.3 ENTERING THE CAPTURE TASK

To enter the Capture Task, click on **Task** in the WAN Analyzer Main Menu, then click on **Capture** from the list of choices. After doing so, two things occur:

- Setup and Actions appear as choices in the Main Menu.
- The Capture screen appears (see Figure 4-1) with a list of the all the frame conditions that will currently pass filters. This is a default screen — if desired, you can also display a list of the signaling lead conditions and contents matching criteria that will pass a filter.

  If you're entering the Capture Task for the first time in a WAN Analyzer session, and you haven't recalled a previous set of filter criteria from a configuration file, the Capture screen lists all possible frame events as "pass" conditions, which indicates the default capture mode is Pass all. If desired, you can verify this by clicking on **Setup** to open the menu, and viewing the check mark next to **Mode: Pass all**. Pass all indicates all the possible filter combinations for the selected protocol.

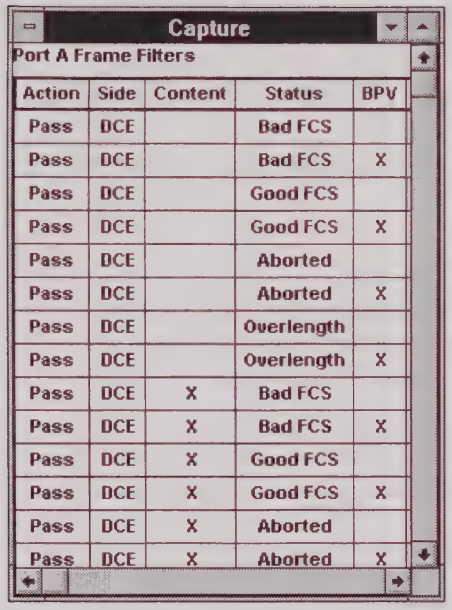

Capture
Port A Frame Filters
Action Side Content Status BPV
Pass DCE Bad FCS
Pass DCE Bad FCS X
Pass DCE Good FCS
Pass DCE Good FCS X
Pass DCE Aborted
Pass DCE Aborted X
Pass DCE Overlength
Pass DCE Overlength X
Pass DCE X Bad FCS
Pass DCE X Bad FCS X
Pass DCE X Good FCS
Pass DCE X Good FCS X
Pass DCE X Aborted
Pass DCE X Aborted X

Figure 4-1
The Opening Capture Screen

4.3.1 If The Capture Task Cannot Be Selected...

If Capture cannot be selected (i.e., if it is grayed out) from the Task menu, it is most likely because of the following:

1. You haven't selected a test module connection in the WAN Port Configuration dialog box. To do this:

   a. Click on **Task**, then select **Setup** from the Task menu.

      RESULT: A submenu appears to the right of the Task menu.

   b. Click on **Ports**.

      RESULT: The WAN Port Configuration dialog box appears on the display.

   c. Change the Test Module setting from No Connection to the link protocol connection that is appropriate for the test.

   d. Click on **OK**.

2. The Capture Task may already be open. You can verify this by arranging the open Tasks by title, as follows:

   a. Click on the **Window** menu selection.

      RESULT: The Window menu choices are displayed on the screen.

   b. Click on **Cascade**.

4.4 WHAT YOU CAN DO IN THE CAPTURE TASK

The Capture Task enables you to do all of the following:

1. Set filters on frame events, as follows:

   a. Originator of the frame (DTE/DCE or TX/RX).

   b. Matching bit patterns and message types (e.g., X.25 Receive Ready) within the frame.

   c. Bipolar violations.

   d. Frame status (e.g., good FCS, bad FCS, etc.).

2. Set filters based on changes in lead states (for data interfaces) or signal transitions (for T1). The signal changes that are available to you are based on the current physical level interface. This selection is made in the Data Configuration dialog box of the T1/Data module (see Section 2.2.1).

   NOTE: You can specify multiple filters, as needed, for any given test. The maximum number of filters is determined by the number of unique (mutually exclusive) filter setups. If you setup two filters that are not unique, the following warning message is displayed: **There is a filter conflict!** Click on **OK** to close the warning message.

3. In addition to passing events to the capture buffer, use specific frame or signaling events to start or stop the Capture Task.

The maximum number of filters that can be set (2 to 256) is determined by the Link Protocol selection made on the WAN Port Configuration dialog box.

You can setup multiple filters for the test you want to run, and the filter numbers are assigned in numerical order according to port selection and according to filter type. As an example, if the first five filters are designed to capture frame events for Port A, and the sixth filter is designed to capture signaling leads:

- The frame filters are assigned the numbers 1 through 5 in the order in which they were created.
- The signaling lead filter is assigned the number 1 (rather than the number 6), because it is the first such filter created on Port A.

Taking this example a step further, assume you are performing a dual port test, and you are setting filters for Port B. In these instances, filter numbers are assigned independently from the filter numbers set in Port A. Thus, the frame event and signaling lead numbers start over again from number 1 in the order in which the filters were created.

If you setup two filters that have the same settings but different Actions, clicking on **OK** in the Filter Setup dialog box causes the warning message: **There is a filter conflict!** to be displayed. Click on **OK** in the warning message to close the dialog box. The Filter Setup dialog box is again displayed. Now change the parameter(s) causing the filter to not be unique and then click on **OK**. Or you can click on **Cancel** to close the dialog box.

Keep in mind that each filter you specify must be unique and cannot have conflicting Actions. What this means is that if you set a Frame Setup dialog box as follows by putting check marks in the following boxes:

Selection	Condition
Source	RX1
AND	Source
Status	FCS Good
AND	Status
Action	Pass

You cannot set another filter with any of the previously selected conditions and then choose a different Action. If you do, it causes a filter conflict.

4.5 HOW THE CAPTURE TASK WORKS

Capture filters for both frame and signaling leads are configured in a dialog box called Filter Setup. The Filter Setup dialog box has three main parts (see Figure 4-2):

1. Event filters.
2. The AND gate.
3. The Actions box.

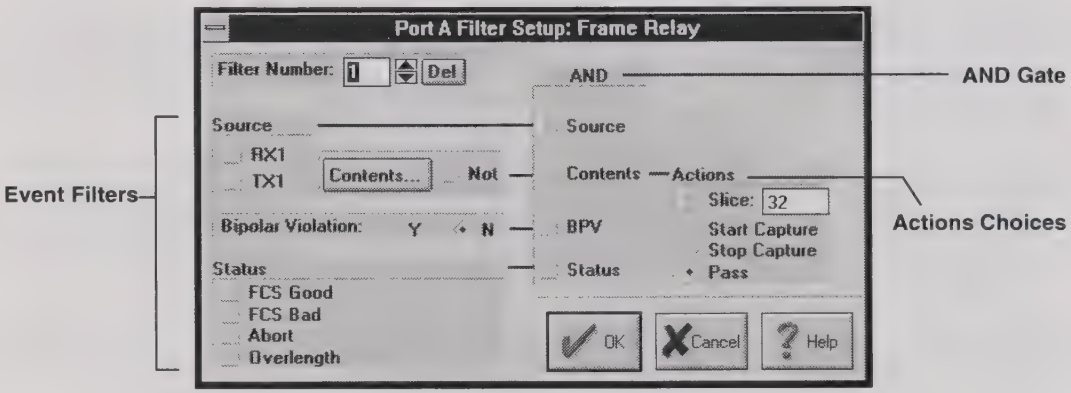


Figure 4-2
The Three Parts of All Filter Set-Up Dialog Boxes

The three main parts of a Filter Setup dialog box each have a unique role in configuring filters:

1. Event filters let you specify the condition(s) by which you want frames or lead signaling states to be filtered.

2. The AND gate lets you activate the conditions you specified in the event filter. Unless one or more boxes are checked in the AND gate, no filtering occurs.

3. The Actions box lets you identify an action that an event filter will trigger. When setting frame filters, the Actions box appears on the right side of the screen; when setting signaling lead filters, the Actions box appears below the AND gate.

Clicking on **Mode: Use filters**, then clicking on **New Frame filter...** (under the Setup menu for Capture manager), displays the Filter Setup dialog box. If you don't put a check mark in any of the AND gate selections and you click on **OK**, you have done the same thing as clicking on **Mode: Pass all** from the Setup menu.

Making Selections Within the Event Filter, AND Gate, and Actions Box

To select the choices within an event filter, AND gate, or Actions box, click on the choice itself or click on the box or diamond next to the choice.

NOTE: Filter settings cannot be saved unless they are part of a larger configuration file. Otherwise, they are deleted at the conclusion of a WAN Analyzer session.

The event filters, the AND gate, and the Actions box are described in the following sections.

4.5.1 Event Filters

The Event filter determines the condition(s) by which a frame or signaling lead is captured or ignored. The actual event(s) you set up to pass a filter are primarily determined by whether you are capturing frame events or signaling leads.

The Source selection determines which line's data is being detected. The Source selection is made using the T1 Configuration or Data Configuration dialog box. When T1 Configuration is selected, the Source selections are either RX1/TX1 or TX2/RX2. When Data Configuration is selected, the Source selections are DCE/DTE.

Bipolar Violations determines whether bipolar violations are to be detected (Y), or bipolar violations are to be ignored (N).

Status determines the frame status conditions that are to be detected. Status conditions detected are: FCS Good, FCS Bad, Abort, and Overlength. When one or more conditions are listed under a single event filter (e.g., Status in Figure 4-2) these conditions are ORed together. This means that, even though more than one of these conditions are selected, only one condition needs to exist in a frame or signaling lead for the event filter criteria to be met. For example, assume (as shown in Figure 4-2) you have placed a check mark in the FCS Bad, Abort, and Overlength boxes under Status. In this instance, a frame will pass the status event filter if:

- The frame contains a BAD FCS.

  or

- The frame was aborted.

  or

- The frame exceeded the standard length.

IMPORTANT: Event filters only enable you to set conditions. To activate a condition as a filter criteria, you must use the AND gate, described in the following section.

4.5.2 The AND Gate

The AND gate is where you activate the condition(s) you want to apply to the filter you are currently setting. For example, Figure 4-3 shows how the various event filters on the left side of the screen are set: TX1 is the selected Source condition, Y (yes) is the Bipolar Violation condition, and FCS Bad and Overlength are the status conditions. Most importantly, the figure also shows none of the choices in the AND gate are checked.

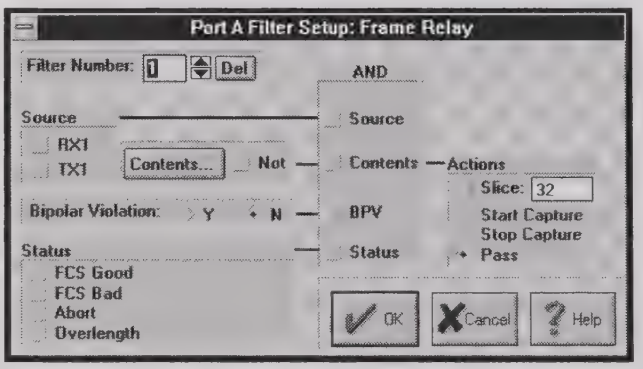


Figure 4-3
Example: Event Filters Selected With No AND Gate Choices Checked

When:	And:	Then:
You make event filter selections such as those shown in Figure 4-3.	None of the choices in the **AND** gate choices are checked.	No conditions are set. All frames pass this filter.

Let's assume, however, that having made these selections in the event filter, you checked **Source** and **Status** in the **AND** gate (see Figure 4-4).

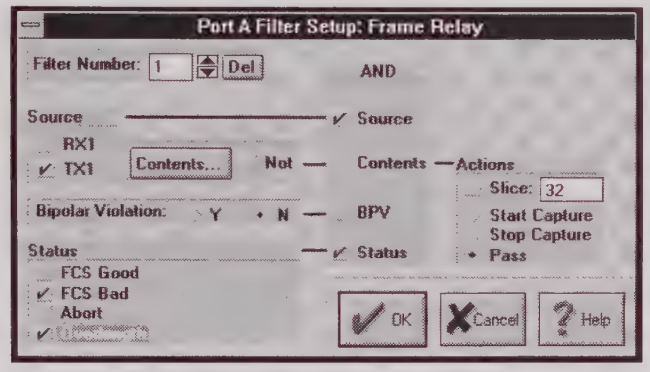


Figure 4-4
Example: Event Filters Selected With AND Gate Choices

When:	And:	Then:
You make event filter selection such as those shown in Figure 4-4.	You have checked **Source** and **Status** in the AND gate.	Frames that originate at TX1 that have a Bad FCS or are over the standard length will pass this filter and be sent to the capture buffer.

To review, based on what is checked in the AND gate shown in Figure 4-4, a frame MUST meet the following criteria to be captured:

1. Originate at TX1.

   and

2. Contain a bad FCS or go beyond the allowable length.

It is important to note what you have not checked in the AND gate is also significant. For example, by not checking the AND gate Contents box, you have, by implication, declared the following:

3. Contents matching doesn't matter for this filter as long as conditions 1 and 2 are met, frames that do and don't meet any contents-matching criteria you may have set up can pass the filter. Please note that contents matching is described in Section 4.6.2.

By not checking the AND gate BPV box, you have also, by implication, declared the following:

4. BPVs don't matter for this filter (even though you have specified Y (for YES) in the event filter) as long as conditions 1 and 2 are met, frames with and without BPVs can pass the filter. This should also serve to remind you that an event filter condition is not active until you check the appropriate box in the AND gate.

4.5.3 The Actions Box

Once you set conditions in the event filters, and activate the conditions you want to apply to the filter in the AND gate, you can use the Actions box to identify an activity the filter can automatically trigger.

Table 4-1 lists the activities that are available to you in the Actions box.

Table 4-1
Actions Box Choices

Choose:	When You Want To:
Slice	Limits capture to the specific number of bytes (octets) at the beginning of a frame, as opposed to capturing the frame in its entirety. When choosing Slice (by inserting a check mark in the box to the left of the label), use the box to the right of the selection to fill in the number of bytes you want to capture in each frame. For example, if you enter the value 20, only the first 20 bytes in each frame that meets the filter conditions you specified are captured. The default Slice value is 32 bytes. Slice enables you to maximize the buffer or disk space by limiting the capture of certain frames to the bytes that are important to you. For example, assume you're testing Frame Relay with a 2-byte header, and you're only interested in bytes that contain the address. In such instances, you would enter 2, which limits the capture to the first 2 bytes of the frame. By not putting a check mark in the Slice box, the default slice size is 16384 bytes. Slice only applies to frame filters. As such, it does not appear if you are setting filters on signaling leads.

Table 4-1
Actions Box Choices (Continued)

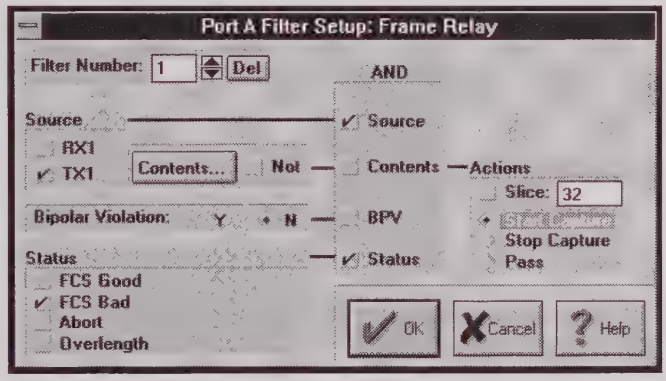
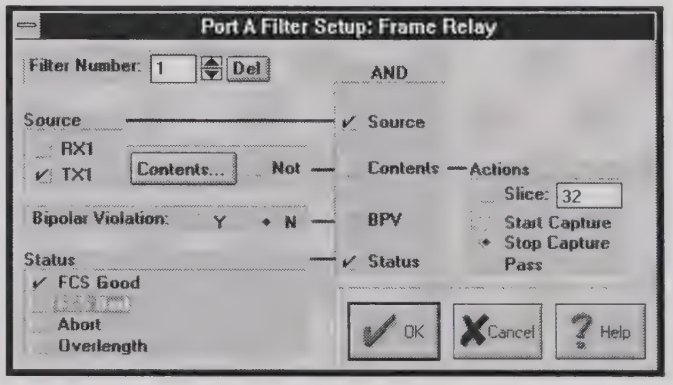
Choose:	When You Want To:
Start Capture	Use a filter requirement as a trigger that starts the capture activity. When choosing Start Capture, you must designate the Initial Capture State as OFF in the Capture Mode Setup dialog box. Start Capture enables you to maximize the buffer or disk space by starting the Capture Task when a frame meets the criteria you specified in the filter. For example, if you want to delay capture until you received a frame with a bad FCS, make sure that: 1. The Initial Capture State is OFF (see the Capture Mode Setup dialog box, described in Section 2.2.3). 2. You set the filter as shown in Figure 4-5.  **Figure 4-5** **Starting Capture** **NOTE:** You can start capture only once during any given WAN Analyzer session. Subsequent events that would cause a start capture have no effect since capture has already been started.

Table 4-1
Actions Box Choices (Continued)

Choose:	When You Want To:
Stop Capture	Use the filter requirements as a trigger that stops the capture activity. When choosing Stop Capture you must designate the Initial Capture State as ON in the Capture Mode Setup dialog box. Stop Capture enables you to end the capture activity when you have all the data you require. For example, if you want to stop capture when you received a frame with a good FCS, be sure that: 1. The Initial Capture State is ON (see the Capture Mode Setup dialog box, described in Section 2.2.3). 2. You set a filter as shown in Figure 4-6.  **Figure 4-6** **Stopping Capture** **NOTE:** You can stop capture only once during any given WAN Analyzer session. Click on **Start** under Task to restart the WAN test.
Pass	Take no action when a frame or signaling lead passes filter requirements, and passes the data to the capture buffer.

The following sections describe the setting of filters on frame and signal events, respectively.

4.6 SETTING FILTERS ON FRAME EVENTS

4.6.1 Setting a New Frame Filter

To set a new frame filter, or a series of new frame filters, start by doing the following:

1. Click on **Setup**.
2. Select **Mode: Use Filters** from the open menu to change the Pass all state and begin the process of setting frame filters.
3. Click on **Setup** once again.
4. Select **New Frame filter...** from the open menu.

   RESULT: The Filter Setup dialog box appears on the display. The title of the dialog box reflects the port for which you are setting filters (A or B). Additionally, the name of the link protocol that appears in the title bar is identical to the link protocol specified in the WAN Port Configuration dialog box.

Once the Filter Setup dialog box appears on the display, you can set the frame filter criteria for the test you want to run. It is recommended that you read Section 4.5 in its entirety to understand how this dialog box is configured.

After you have configured the Filter Setup dialog box:

- Click on **OK** to activate the filter criteria you have set up.

  RESULT: The Capture screen automatically displays a summary of the current frame filter criteria (the filters are ORed).

At this point, you can:

- Continue to set filters as required.
- Start the test.
- Enter another Task.

Keep in mind that if you setup two filters that have the same settings but different Actions, clicking on **OK** in the Filter Setup dialog box causes the warning message: **There is a filter conflict!** to be displayed. Click on **OK** in the warning message to close the dialog box. The Filter Setup dialog box is again displayed. You can now change the parameter(s) causing the filter to not be unique and then click on **OK**. Or you can click on **Cancel** to close the dialog box.

Since all of the link protocols that can be selected with the WAN Analyzer are HDLC-based (except T1 ATM, SMDS L2 PDU, and SMDS L3 PDU), the choices in the Filter Setup dialog box are always the same as the ones shown in Figure 4-2. However, link protocols do differ in the way contents matching criteria is set up. Contents matching is described in the following section.

4.6.2 Contents Matching

Contents matching gives you the ability to limit the capture of data to a specific bit pattern, which you specify in the Contents match dialog box. If you know the type of information you want to analyze (e.g., an address, a Receive Ready (RR) frame, etc.), contents matching can save test time and buffer space by limiting the capture to a very specific set of data.

Entering the Contents Match Dialog Box

Bit patterns used for contents matching are created in the Contents match dialog box, which is entered from any frame filter. To create a new bit pattern, enter the Contents match dialog box as follows:

1. Click on **Setup**.
2. Select **Mode: Use filters** from the open menu to exit the Pass all state and begin the process of setting frame filters.
3. Click on **Setup** once again.
4. Click on **New Frame filter...** from the open menu.

   RESULT: The Filter Setup dialog box appears on the display.

5. Click on **Contents**, which appears to the right of the RX1 and TX1 event filters.

   RESULT: The Contents match dialog box (see Figure 4-7) appears on the display. The title of the dialog box reflects the port for which you are setting filters (A or B). Additionally, the name of the link protocol that appears in the title bar is identical to the link protocol specified in the WAN Port Configuration dialog box.

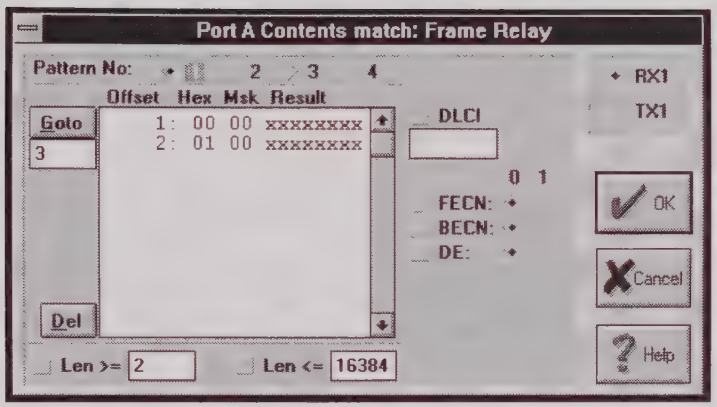


Figure 4-7
Sample Contents Match Dialog Box

Basic Rules For Creating Bit Patterns

Once the Contents match dialog box appears on the display, you can begin creating the bit pattern(s) you want to find a match for in the test data. The following rules apply:

1. You can create up to four 8-bit patterns for each source (i.e., RX1 and TX1), which means you can create up to eight different bit patterns for contents matching in a single filter.

2. Each bit pattern consists of one or more individual octets (i.e., bytes). You may have as few as 1 octet or as many as 16,384 octets in a single bit pattern.

3. The **Len >=** and **Len <=** fields respectively reflect the minimum and maximum number of octets a frame must contain to be eligible for a contents match.

    a. If the box to the left of **Len >=** is not checked, the minimum number of octets a frame must contain defaults to the total number of octets (i.e., offsets) you have already created in the bit pattern. The value in the **Len >=** box automatically increases by one each time you add a new octet to the bit pattern.

    b. If you place a check in the box to the left of **Len >=**, it indicates that you want to override the minimum default value by entering one of the own. The value you specify must be within the range of 1 to 16,384.

    c. The value of **Len >=** must always be the same in Pattern Numbers 1 and 3, and Pattern Numbers 2 and 4, respectively. The WAN Analyzer ensures you have met this condition by automatically updating the pattern number you're no*t* working in. For example, if you change the value of **Len >=** Pattern No. 3, or if the value automatically increases or decreases by default, the identical change in value automatically takes place in Pattern No. 1.

d. If the box to the left of **Len <=** is not checked, the maximum number of octets a frame must contain is the default – 16,384.

e. If you place a check in the box to the left of **Len <=**, it indicates you want to override the default by entering a maximum value of the own. The value you specify must be within the range of 1 to 16,384.

f. Unlike **Len >=**, each Pattern No. may have unique **Len <=** values.

4. If you have created more than one bit pattern (i.e., Pattern No.), an incoming data pattern need only match one of the patterns to pass the filter and be captured. For example, if an incoming data pattern does not match the contents of Pattern No. 1, but does match the contents of Pattern No. 2, it passes the filter and is captured.

The Components of the Contents Match Dialog Box

As shown in the sample dialog box in Figure 4-7, the Contents match dialog box has a number of individual components. Each one is described in Table 4-2.

Table 4-2
The Components of the Contents Matching Dialog Box

The Component:	Lets You Do the Following:
Pattern No.	Enter the bit pattern number for the contents matching filter you are creating. (Click to place a dot in the appropriate diamond.) Paragraph Number 1 in the previous section describes the basic rules for pattern numbers.
RX1/TX1	Choose the source of the data you want to match. (Click to place a dot in the appropriate diamond.)
Pattern Editor	Create and edit the bit pattern you want incoming data to match. The individual parts of the editing box are described from right to left, as follows: **Result** enables you to manually create the matching criteria for each bit in an octet. A zero (0) indicates that incoming data must have a value of 0 to be considered a match in the bit position you are working in; a one (1) indicates that incoming data must have a value of 1 to be considered a match in the bit position you are working in; an x indicates you don't care, and both values are considered a match. These three characters are the only values that are accepted in this field; place the cursor to the left of the bit position you want to work in, then use the keyboard to enter the appropriate character. Also note that as you change the bits in the octet, the Hex (hexadecimal) and Msk (mask) values automatically change to reflect the hexadecimal and mask value of the octet, respectively.

Table 4-2
The Components of the Contents Matching Dialog Box (Continued)

The Component:	Lets You Do the Following:
	Msk enables you to identify the mask value of the current octet in hexadecimal. The mask value is determined by the number of specific bits (i.e., ones and zeros), as well as the number of "don't cares", in each nibble (i.e., four bits) of the octet. For example, Figure 4-8 shows the Hex value of Offset 1 is AA, which means that the equivalent binary Result value of the octet is 10101010. The Msk value (FF) tells you there are no masks (i.e., "don't cares") in the octet. To manually change the mask value, press the **Enter** key until the cursor appears to the left of the current value, then use the keyboard to enter the appropriate characters. Also note that as you change the Msk value, the octet automatically changes to reflect the new mask. **Hex** specifies the actual hexadecimal value (as opposed to the mask value) of the current octet. To manually change this value, use the mouse to place the cursor to the left of the current value, then use the keyboard to enter the appropriate characters. Also note that as you change the value, the octet automatically changes to reflect the new mask. **Offset** is the byte in the incoming frame to which the matching criteria should apply, starting with the first octet in the frame (not counting the flag). For example, in X.25/LAPB, Offset 1 is always reserved for the address, Offset 2 is reserved for the frame type, etc.
Goto	Select a specific offset number. To edit an existing offset, simply enter the appropriate number in the box provided, then press the **Enter** key. If the offset number you enter doesn't exist, then it will be created for you and placed in numerical sequence within the pattern.
Del	Delete any offset in the bit pattern. To do this, simply place the cursor anywhere in the offset by pointing and clicking, then press the **Del** button.
Len >=	Select the minimum number of octets a frame must contain to be eligible for a contents match. Paragraph Number 3 in the previous section describes the basic rules of **Len >= usage**.
Len <=	Select the maximum number of octets a frame must contain to be eligible for a contents match. Paragraph Number 3 in the previous section describes the basic rules of **Len <= usage**.

Table 4-2
The Components of the Contents Matching Dialog Box (Continued)

The Component:	Lets You Do the Following:
Frame and Bit Helpers	Get help in matching key frame- and bit-types to specific offsets and bit positions within the offsets, respectively. The frame and bit helps that are available to you will vary based on the link protocol you select in the WAN Port Configuration screen. The section immediately following this table describes how you can use these windows as tools for building a bit pattern quickly and easily, even if you aren't completely familiar with the protocol you want to analyze.
OK	Save the Contents match dialog box and return to the Filter Setup dialog box.
Cancel	Cancel the latest entries in the Contents match dialog box, return all entries to their original settings, and return to the Filter Setup dialog box.

A Simple Example of Setting Up a Contents Match

Assume you're testing an X.25 network, and you want to look at all TX1-originated REJECT (REJ) frames from address 10101010 (hex value AA). After entering the Contents match dialog box, do the following:

1. Place a dot in the TX1 diamond by pointing and clicking on its center.

2. Place a check mark in the Addr box by pointing and clicking on the box itself or by pointing and clicking on the Addr label.

   RESULT: In X.25/LAPB, Offset 1 is always reserved for the ADDRESS. Since you checked the Addr box, Offset 1 automatically appears in the pattern editor.

3. Enter the value AA in the Hex box, then press the **Enter** key.

   RESULT: The pattern editor shows that the octet in Offset 1 has a Hex value of AA, and a Result value of 10101010. Since no masks (i.e., "don't cares") have been set, the Msk value is FF (see Figure 4-8).

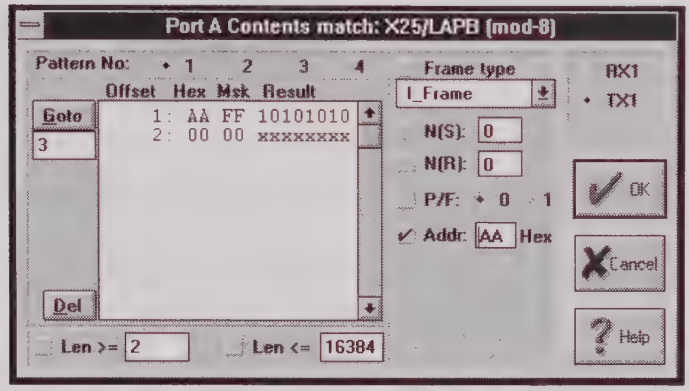


Figure 4-8
Sample Address Offset

Let's assume, for example, that you've changed the mind, and you want to look at REJ frames from ALL addresses. In such instances, simply remove the check mark from the Addr box.

RESULT: All eight bits of the Result octet become xxxxxxxx (i.e., "don't cares"). Since the true value of the address, (i.e., AA or 10101010) is entirely masked, the Msk value is now 00.

4. Open the Frame type box by clicking on the arrow underneath the label.

   RESULT: The list of X.25/LAPB frames you can select appear on the display.

5. Click on **REJ** to make that selection current, then place a check mark in the box to the left of Frame type. At this point, two things happen:

   a. In X.25/LAPB, Offset 2 is always reserved for the FRAME TYPE. Since you checked the Frame type box, Offset 2 is automatically set for the REJ frame value.

   b. The Result octet in the pattern editor is xxxx1001, which is the WAN Analyzer's "default" value for the REJ frame.

6. Assume you want to limit the data capture to REJ frames with an N(R) value of 5. After pointing and clicking on the box to the right of the N(R) label, and after placing the cursor to the left of the 0 in the box, use the keyboard to change the value of N(R) to 5.

   RESULT: The three most significant bits in the octet, which, in REJ frames, are reserved for the N(R) value, change from 000 (i.e., 0) to 101 (i.e., 5).

   If, alternatively, you choose not to isolate the REJ capture to a specific N(R) value, simply remove the check mark from the box to the left of label.

   RESULT: The three most significant bits in the octet change from 000 to xxx (i.e., "don't cares").

7. In the same fashion as N(R), use the P/F helper to assign a value of 0, 1, or "don't care" based on the capture requirements.

8. In X.25/LAPB, Offsets 3 and above are reserved for packet-specific data. If you want to match on any of these offsets, enter the contents-matching octets manually.

9. When you have completed the entire bit pattern, click on **OK** to save the contents matching criteria.

   RESULT: The WAN Analyzer returns you to the Filter Setup dialog box.

10. If you want to activate the contents matching criteria, check **TX1** in the event filter, and both **Source** and **Contents** in the AND gate.

    If you want to capture all information except what you specified as contents matching criteria, check **TX1** and Not in the event filter, and both **Source** and **Contents** in the **AND** gate.

4.6.3 Displaying the Current Frame and Contents Filters

The WAN Analyzer gives you the ability to display the frame and contents filters that will be in effect for the test you want to run.

Displaying The Current Frame Filters

To display a list of the current frame filters, do the following:

1. Click on **Actions**.

2. Select **Display Frame filters** from the open menu.

   RESULT: The Capture screen lists the total number of pass, start, and stop conditions you have set in all the frame events.

Displaying The Current Content Filters

To display the minimum and maximum length of the current content filters by source and pattern number, do the following:

1. Click on **Actions**.
2. Select **Display Content Filters** from the open menu.

   RESULT: The Capture screen displays the grid shown in Figure 4-9.

Port A Content Filters

	RX1		TX1	
Pattern	Min len	Max len	Min len	Max len
1	0	0	23	16384
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

Figure 4-9
Displaying The Current Content Filters

4.7 SETTING FILTERS ON LEAD OR SIGNAL TRANSITIONS

4.7.1 Setting a New Lead or Signal Filter

To begin the Task of setting a new lead or signal filter, do the following:

1. Click on **Setup**.
2. Select **New Lead Filter** from the open menu.

   RESULT: The appropriate Filter Setup dialog box appears on the display. The title of the dialog box reflects the port for which you are setting filters (A or B).

The contents of the Filter Setup depends on the test type and/or the interface you select in the Data Configuration or T1 Configuration dialog box of the T1/Data Test Module (see Section 2.2.1). For example, if, as shown in Figure 4-10, you have selected **Data WAN Protocol** as the test type, and as the interface.

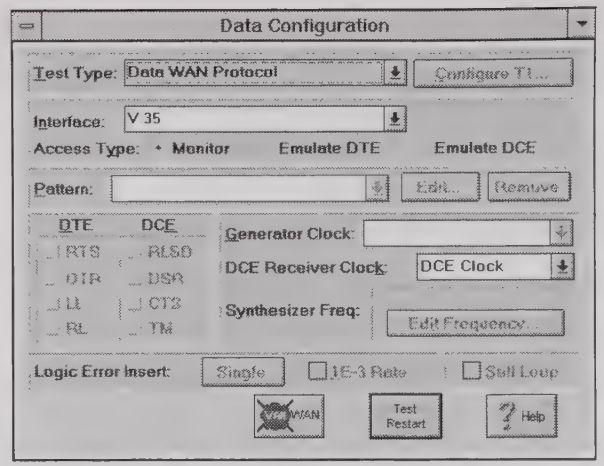


Figure 4-10
Data Configuration Screen With Data WAN Protocol and V.35 Interface Selected

These lead state transitions will appear on the Filter Setup dialog box (see Figure 4-11).

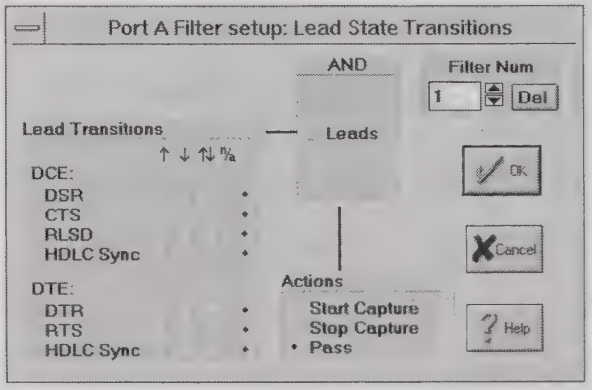


Figure 4-11
Sample Filter Dialog Box With V.35 Lead State Transitions

However, if you select **T1 WAN Protocol** as the test type, the Filter Setup dialog box will contain the status signals shown in Figure 4-12.

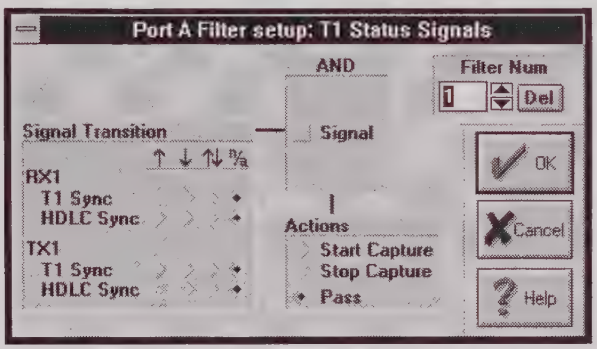


Figure 4-12
T1 Signal Status Transitions

4.7.2 Setting Lead and Status Signal Transitions

For purposes of example, Figure 4-13 shows the lead transitions available in the Filter Setup dialog box when you have selected **Data WAN Protocol** as the test type and **RS-232** as the current interface.

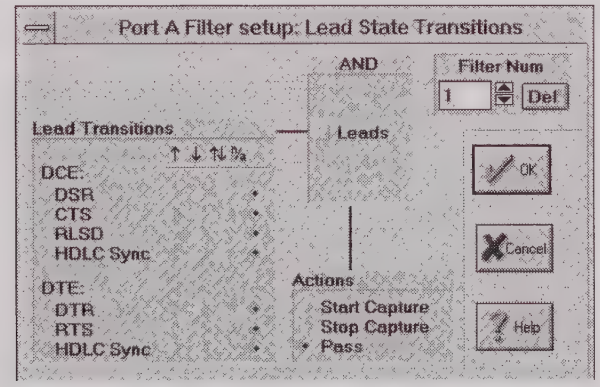


Figure 4-13
Sample Lead Transitions (RS-232 Interface)

The figure shows that the DTE and DCE lead state transitions for RS-232 are:

DCE:	**DTE:**
Data Set Ready (DSR)	Data Terminal Ready (DTR)
Clear To Send (CTS)	Request To Send (RTS)
Received Line Signal Detector (RLSD)	High Level Data Link Control (HDLC) Sync
HDLC Sync	

The four capture events available to you with each of these signaling leads appear horizontally across the screen, as follows:

↑ — Take action (i.e., pass filter, start capture, or stop capture) if a lead or signal state switches from OFF to ON.

↓ — Take action if a lead or signal state switches from ON to OFF.

↑↓ — Take action if a lead or signal state switches from OFF to ON or ON to OFF.

n/a — The lead or signal transition is not applicable for the filter you are setting. This is the default setting for all Lead Transitions and Signal Transitions.

NOTE: Changing any Lead Transition or Signal Transition status change from n/a to any other condition without checking the Signal box changes all lead/signal states to Pass.

For example, assume you want to capture transitions where CTS went from OFF to ON and transitions where RTS went from ON to OFF. The Filter Setup dialog box should appear as shown in Figure 4-14.

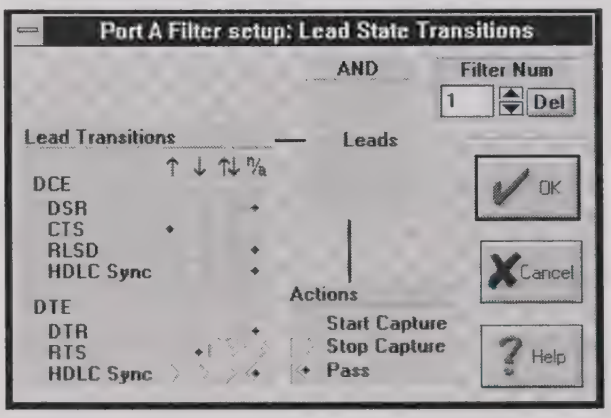


Figure 4-14
Sample Lead Transitions Screen

To complete the dialog box shown in Figure 4-14 (or, for that matter, any lead or signaling transition screen) do all of the following:

1. Click on the dot in the center of the diamond that represents the lead or signal transition and the status change (e.g., up to down, down to up, etc.) you want to use as a filter event.

2. If you are using a data interface, place a check mark in the AND gate Leads box to activate the selected lead transition events; if you are using a T1 interface, place a check mark in the AND gate Signal box to activate the selected signal transition events.

3. Identify the action you want the filter to take in the Actions box (pass the event, start capture, or stop capture).

4. After you have configured the Filter Setup dialog box as desired, click on **OK** to activate the filter criteria you have set up.

   RESULT: The Capture screen automatically displays a summary of the current lead filter criteria.

4.7.3 Displaying The Current Lead or Signal Filters

To display a list of the current lead filters, do the following:

1. Click on **Actions**.

2. Select **Display Lead filters** from the open menu.

   RESULT: The Capture screen lists the total number of pass, start, or stop conditions you have set in all the frame events.

4.8 FILTER MANAGEMENT

4.8.1 Clearing All Filters

To clear all of the current filters (i.e., frame, lead, and content) on the port you are configuring, do the following:

1. Click on **Actions**.

2. Select **Clear all filters** from the open menu.

   RESULT: A port-specific warning like the one shown in Figure 4-15 appears on the screen.

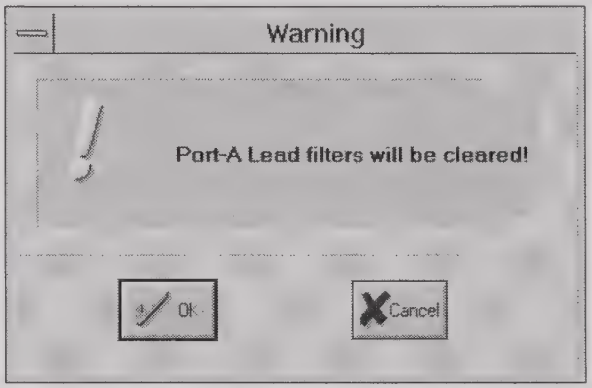


Figure 4-15
Warning Message When Clearing All Filters on Port A

3. Click on **OK** to clear all of the current frame filters. You can ensure all of the filters have been cleared by:

   a. Pointing and clicking on **Actions**.

   b. Selecting **Display Frame filters**, **Display Content filters**, and **Display Lead filters** in sequence.

      RESULT: Each summary display should list all possible conditions as pass, or, in the case of content filters, indicate that no such filters are set.

4.8.2 Clearing Individual Filters

To clear any specific filter, do the following:

1. Click on **Actions**.

2. If the summary display of the filter-type you want to delete (i.e., frame or lead) is not shown on the screen, click on **Display Frame filters** or **Display Lead filters** to make that type current; otherwise, proceed to Step 4.

3. Click on **Actions** once again.

4. Select Edit Filters from the open menu.

   RESULT: Frame or Lead Filter No. 1 appears on the screen.

5. Click on the top part of the "spin" button (i.e., the double arrow immediately to the right of the filter number) to move up through the filter number until the filter you want to delete appears on the screen. If desired, you can move down through the filter numbers by pointing and clicking on the bottom part of the "spin" button.

6. When the filter you want to delete appears on the screen, click on **Del** (to the right of the "spin" button).

   RESULT: The filter number count decreases by one, indicating the filter is deleted, and the one immediately preceding it in sequence is now visible on the screen.

7. Repeat Steps 5 and 6 if you want to delete more than one filter.

8. When you have completed deleting the filter(s), click on **OK** in the Filter Setup dialog box.

   RESULT: The frame or lead filter summary is automatically updated to reflect the filters you deleted.

4.8.3 Changing Individual Filters

To change any filter you have created, do the following:

1. Click on **Actions**.

2. If the summary display of the filter-type you want to change (i.e., frame or lead) is not shown on the screen, click on **Display Frame filters** or **Display Lead filters** to make that type current; otherwise, proceed to Step 4.

3. Click on **Actions** again.

4. Select Edit Filters from the open menu.

   RESULT: Frame or Lead Filter No. 1 appears on the screen.

5. Click on the top part of the "spin" button (i.e., the double arrow immediately to the right of the filter number) to move up through the filter number until the filter you want to change appears on the screen. If desired, you can move down through the filter numbers by pointing and clicking on the bottom part of the "spin" button.

6. When the filter you want to change appears on the screen, edit it as desired.

7. Repeat Steps 5 and 6 if you want to change more than one filter.

8. When you have completed changing the filter(s), click on **OK** in the Filter Setup dialog box.

   RESULT: The frame or lead filter summary is automatically updated to reflect the filters you changed.

4.9 MORE FILTER SETUP HINTS

4.9.1 Passing All Data to the Capture Buffer

At any time during the test, you can ask the WAN Analyzer to override the filters and pass all data to the capture buffer. To do this:

1. Click on **Setup**.
2. Select **Mode: Pass all** from the open menu.

   RESULT: Any frame, lead, or content filters you have set are ignored, and ALL data is passed to the capture buffer.

3. To setup the filters again, click on **Setup**, then select **Mode:Use filters** from the open menu.

   IMPORTANT: **Pass all** is the default set-up mode when you initially enter the Capture Task. To ensure the filters you have set up are in effect prior to the test, and the summary screens accurately reflect the filters that are currently set, you must change the set-up mode to **Use filters** immediately after entering the Capture Task.

It is important to understand the difference between Clear all filters and Pass all, which is available under the Actions menu. Clear all filters deletes all of the filters you have set for the test. Rather than delete them, Pass all overrides them so that they are still available for use during the session.

4.9.2 Blocking All Data From Being Sent to the Capture Buffer

At any time prior to the test, you can ask the WAN Analyzer to override the filters and block all data from being sent to the capture buffer. To do this:

1. Click on **Setup**.
2. Select **Mode: Block all** from the open menu.

   RESULT: Any frame, lead, or content filters you have set are ignored; NO data is passed to the capture buffer.

3. To reestablish the filters, click on **Setup**, then select **Mode: Use filters** from the open menu.

4.9.3 Capturing Pre- and Post-Trigger Data

The Pre-trigger count is the approximate number of frames captured prior to the start trigger occurs. This count is an approximate number, since the number of frames may not be the count specified. Similarly, the Post-trigger count is the approximate number of frames captured after the stop trigger occurs.

To obtain a clear picture of what is occurring around the data you have specified to capture, you can capture a specific number of bytes that were transmitted before a trigger occurred and after the trigger occurred. To do this, do the following:

1. Click on **Setup**.
2. Select **Configuration** from the open menu.

   RESULT: The Capture manager configuration dialog box appears on the display.
3. Using the keyboard, set the Pre-trigger (for the number of bytes to capture before a trigger) and Post-trigger (for the number of bytes to capture after a trigger) byte counts as required. Enter any value between 0 and 9999999 in either area, and the default value for both is 10.
4. Click on **OK**.

4.9.4 Customizing the Appearance of the Capture Screen

The WAN Analyzer gives you the ability to customize the appearance of the Capture screen. You can choose all of the following:

- Font
- Font style (i.e., regular, bold, and/or italic)
- Font size
- Effects (i.e., strikeout and/or underline)
- Color

To customize the appearance of the Capture screen, do the following:

1. Click on **Setup**.

2. Select **Display Font** from the open menu.

   RESULT: The Font dialog box appears on the display (see Figure 4-16).

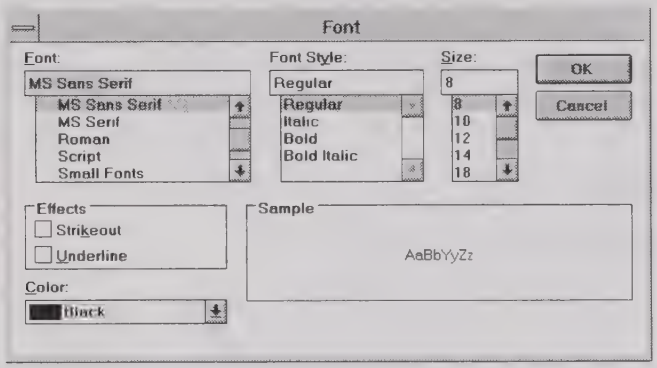


Figure 4-16
The Font Dialog Box

3. Complete each item in the dialog box as desired. The Sample box shows what the sum total of the settings will look like once you put them into effect.

4. When you have customized the Capture screen to the specifications, click on OK to put the new font into effect, or click on **Cancel** to leave the previous font intact.

4.10 CAPTURE-SPECIFIC ICONS

The toolbar icon offers six icons that are specific to the Capture Task, as follows:

Icon:	Description:
	Enables you to create a new frame filter. This icon is identical in function to selecting **New Frame Filter** from the Setup menu.
	Enables you to create a new lead filter. This icon is identical in function to selecting **New Lead Filter** from the Setup menu.
	Enables you to edit the current filter set (i.e., frame or lead). This icon is identical in function to selecting **Edit filters** from the Actions menu.

Icon:	Description:
	Enables you to display the current frame filters. This icon is identical in function to selecting **Display Frame filters** from the Actions menu.
	Enables you to display the current content filters. This icon is identical in function to selecting **Display Content filters** from the Actions menu.
	Enables you to display the current lead filters. This icon is identical in function to selecting **Display Lead filters** from the Actions menu.

Section 3.9 describes toolbar icons in detail.

4.11 WHAT'S NEXT?

4.11.1 After Setting Filters ...

Although there is no cookbook procedure for the activities you'll be performing after you set the filters, it is generally recommended that you do the following in sequence:

1. Start the WAN Analyzer test by:
   a. Pointing and clicking on **Task** in the WAN Analyzer Main Menu.
   b. Pointing and clicking on **Start**.
2. Enter the Display Task and, if desired, set the post-capture filters. (Section 5 describes this activity.)
3. View the data you captured in the Display Task. (Section 5 describes this activity.)
4. Enter the Statistics Task and choose the results you want to accumulate and display (e.g., frame counts, link usage, etc.). (Section 6 describes the Statistics Tasks in detail.)
5. Enter the Statistics Task and view the results you have accumulated during the test.

   NOTE: If you choose not to gather statistics, Steps 4 and 5 of this procedure need not be performed.

Once the filters are configured, remember you can save the settings to a file along with the entire WAN Analyzer configuration and recall them for future use. (Filter settings alone cannot be saved.) See Section 3.6 for a complete description of how WAN Analyzer configurations are saved.

SECTION 5
DISPLAY — THE WAN ANALYZER PROTOCOL DECODER

5.1 SECTION SUMMARY

This section of the manual gives you detailed information about the WAN Analyzer's Display Task. It describes all of the following:

- The primary purpose of the Display Task.
- The activities associated with the Display Task.
- How you can perform these activities.

5.2 DISPLAY TASK OVERVIEW

The Display Task gives you the ability to display, decode, and study the frames that have been sent to the capture buffer during a test.

5.2.1 Before Running the Display Task ...

Before you select the protocol you want to decode, start the WAN Analyzer, and study the frames that have been sent to the capture buffer, it is recommended that you:

- Enter the Capture Task and set the frame and/or signaling filters that are appropriate for the test. By limiting the frame capture to specific events, you can conduct tests more quickly and efficiently than would be possible if you sorted through all the information that passed through the Analyzer. Section 4 describes the Capture Task in detail.

If desired, you can also enter the Statistics Task and configure the WAN Analyzer to collect detailed data on the link protocol (or protocols if you're running a dual port test) you have selected. Section 6 describes the Statistics Task in detail.

After you have configured the Capture, Display, and Statistics Tasks you can start the test, as follows:

1. Click on **Task** in the WAN Analyzer Main Menu.
2. Select **Run** from the open menu.

5.2.2 What You Can Do in the Display Task

The general activities you can perform in the Display Task are as follows:

1. Display captured frames while a test is in progress using the freeze buffer.
2. Display captured frames at the conclusion of a test using the capture buffer.
3 Decode captured frames so data is displayed in an English-language format. Section 5.10 lists and briefly describes the WAN and encapsulated LAN protocols that can be decoded by the WAN Analyzer.
4. Apply high-level (i.e., post-capture) filtering to the frames in the buffer.
5. Display captured frames in hexadecimal or ASCII format.
6. Display incoming frame events in the real-time window.
7. Control the amount of data displayed for each captured frame.
8. Calculate time deltas between any two frames in the buffer.
9. Set the size of the freeze buffer.

5.3 ENTERING THE DISPLAY TASK

To enter the Display Task, point and click on **Task** in the WAN Analyzer Main Menu, then click on **Display** in the open menu. After doing so, two things occur, as shown in Figure 5-1:

- **Setup** and **Actions** appear as choices in the Main Menu.
- If you haven't recalled a previous set of display criteria from a configuration file, and you haven't started the WAN Analyzer, the opening **Display** screen is blank.

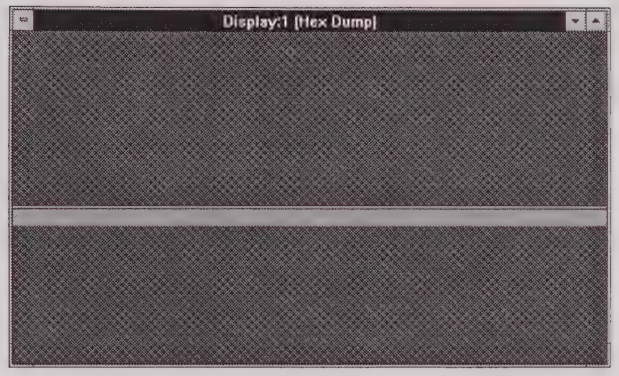


Figure 5-1
Entering the Display Screen

5.3.1 If The Display Task Cannot Be Selected ...

If **Display** cannot be selected (i.e.,"grayed out") in the **Task** menu, it is most likely because of the following:

1. The Display Task may already be in use, and you have already opened two Display screens. You can verify this by arranging the open Tasks by title, as follows:

   a. Click on the **Window** menu selection.

      RESULT: The **Window** menu choices are displayed on the screen.

   b. Click on **Cascade**.

5.3.2 The Browse and Real Time Sections

The Display screen contains two sections (or windows) — the top section is reserved for browsing frame information in the buffer, and the bottom section is reserved for real-time information, which basically serves to show data is entering the buffer. Additionally, the Display screen can be adjusted so either the buffer or real time display occupies the entire area, or one display has a larger viewing area than the other. (This activity is described in detail in Section 5.3.3).

The title bar of the opening screen reads **Display:1**; if desired, you can also open a second screen (**Display:2**), which is especially useful if you're running a dual port test on two link protocols, and you want to display the frames captured from both Port A and Port B at the same time. Section 5.3.4 describes how you can open a second Display screen.

5.3.3 Adjusting the Display Screens

At any time during the Task, you can adjust the Display screen so either the browse or real-time window occupies the entire area, both windows share the screen equally, or one window has a larger viewing area than the other. To adjust the Display screen, do the following:

1. Use the trackball to position the cursor on the thin horizontal line that divides the two windows. (Figure 5-1 shows the dividing line positioned just above the real-time cursor at the bottom of the screen.) When positioned correctly, the cursor becomes a small black "double" arrow, which indicates the line can now be moved UP or DOWN.

2. After clicking and holding on the horizontal line using the Trackball button, use the trackball to drag the line UP or DOWN, as desired.

   EXAMPLE: Assume you won't be browsing until after you stop the Task, and you want to see as much real-time data as possible while the Task is in progress. Use the trackball to position the pointer on the horizontal line. When the pointer becomes a double arrow, click and hold on the line, then use the trackball to drag the line UP until it reaches the bottom of the title bar, at which time you can release the Trackball button.

You can also adjust the screen by pressing the control and up arrow keys simultaneously, or the control and down arrow keys simultaneously.

5.3.4 Opening a Second Display Screen

Just as you can collect and display two sets of link protocol statistics during a single Task (as described in Section 6), you can open two Display screens and study the frames generated by the two link protocols in a dual port test. To open a second screen (labeled **Display:2** in the title bar), simply do the same thing you did to enter the **Display** Task — click on **Task** in the WAN Analyzer Main Menu, then click on **Display** from the open menu.

5.3.5 Viewing the Display:1 and Display:2 Screens Simultaneously

After setting up both screens for the test you want to run, you may find it useful to view the **Display:1** and **Display:2** screens simultaneously so you can study the frames that you have captured at the same time. You can do this as follows:

1. Click on **Window** in the WAN Analyzer Main Menu.

2. Select **Tile** from the open menu.

5.4 USING THE REAL-TIME AND BROWSE WINDOWS

Although it is recommended that you identify the protocol decode and post-capture filtering requirements *before* you actually display data, for purposes of example, this section assumes neither activity has taken place. It also assumes all of the following:

1. You have correctly connected the WAN Analyzer to the device you want to test.
2. You have configured the Capture and Statistics Tasks as appropriate for the test you are about to run.
3. You are running a single port test with Frame Relay as the link protocol. The **Display:1** screen is visible on the display, and, because you are starting a new Task, the screen is blank.
4. You have just started the WAN Analyzer by opening the **Task** menu and selecting **Run** from the open menu.

5.4.1 Displaying Frame Events in the Real-Time Window

The **Real-Time** window (i.e., normally visible at the bottom of the Display screen) basically serves to let you know data has entered the capture buffer. It displays the first line of the event header for each frame entering the capture buffer, and contains the following information:

- Port of origin.
- Source of the frame (DTE or DCE).
- Frame ID number.
- Date and time of the event.

NOTE: Lead state events (identified in the Capture Task) may cause gaps in sequence of ID numbers.

Note that, at the very beginning of the Task, the browse window is still empty, and remains so until:

1. You select **Browse freeze buffer** from the **Actions** menu to study frames while the Task is in progress.
2. You stop the WAN Analyzer. If you haven't used the freeze buffer, all data that is currently in the capture buffer is automatically sent to the browse window.

Sections 5.4.2 and 5.4.3 describe how you can browse the freeze and capture buffers, respectively.

Enabling/Disabling the Real-Time Window

At any time during a Task, you have the ability to enable or disable the display of real-time data, as follows:

1. Click on **Setup** in the WAN Analyzer Main Menu.

   RESULT: The choices available to you in the **Setup** menu appear on the display.

2. If the display of real-time data is currently enabled, a check mark appears to the left of the **Display realtime** selection; if the activity is disabled, no check mark appears.

   Set the activity to its opposite condition (i.e., turn the check mark ON or OFF) by pointing and clicking on **Display realtime**.

The Real-Time window is enabled by default when you initially enter the Display Task.

5.4.2 Browsing Frames While a Test is in Progress (Freeze Buffer)

Once the frame headers in the Real-Time window indicate data has entered the capture buffer, you can use the freeze buffer to view frame information while the test in progress.

To display frames in the freeze buffer, do the following:

1. Click on **Actions** in the WAN Analyzer Main Menu.

   RESULT: The choices available to you in the **Actions** menu appear on the display.

2. At the beginning of the Display Task, the freeze buffer is disabled (i.e., no check mark appears next to the selection). Enable the freeze buffer by selecting **Browse freeze buffer** from the open menu.

   RESULT: The browse window displays the most recently captured frames (see Figure 5-2). These frames are displayed sequentially, with the earliest frames captured appearing at the beginning (or top) of the buffer, and the most recently captured frames stored at the end (or bottom) of the buffer.

Note that **Browse freeze buffer** is not available (i.e., is "grayed out") when a test is not in progress.

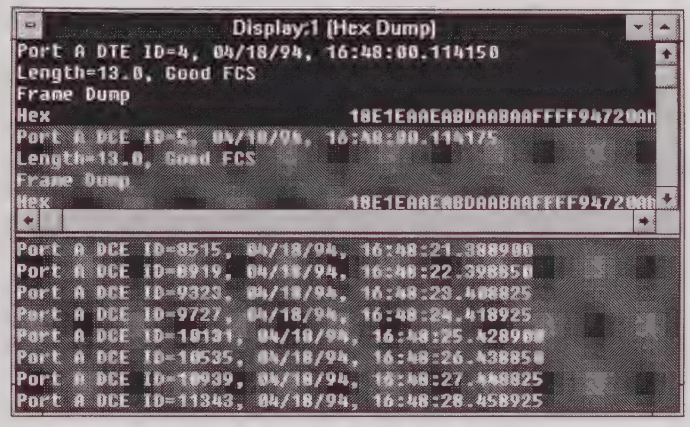


Figure 5-2
The Freeze Buffer Enabled

The event header of each frame displayed in the freeze buffer contains the following information:

- Port of origin.
- Source of the frame (DTE or DCE).
- Frame ID number.
- Date and time of the event.
- The number of bytes in the frame.
- Status information (e.g., good FCS, BPV, etc.).

It is important to understand that the freeze buffer is not a "stand-alone" entity — it is actually that portion of the capture buffer you can retain in memory for browsing and temporary use. If you set aside data in the freeze buffer, it will not be overwritten until you disable the freeze buffer.

Updating the Freeze Buffer

To update (i.e., refresh) the freeze buffer with the most recent frames captured, do the following:

1. Click on **Actions** in the WAN Analyzer Main Menu.

   RESULT: The choices available to you in the **Actions** menu appear on the display.

2. The freeze buffer should be enabled (i.e., check mark next to the selection). Disable the freeze buffer by selecting **Browse freeze buffer** from the open menu.

   RESULT: The browse window is now blank.

3. Click on **Actions** once again.

4. Enable the freeze buffer by selecting **Browse freeze buffer** from the open menu.

   RESULT: The browse window updates the freeze buffer with the most recently captured frames.

You can complete this activity in two steps by closing and then opening the **Book** icon on the Display toolbar.

Disabling the Freeze Buffer

To disable the freeze buffer, do the following:

1. Click on **Actions** in the WAN Analyzer Main Menu.

   RESULT: The choices available to you in the **Actions** menu appear on the display.

2. Remove the check next to the **Browse freeze buffer** selection.

   RESULT: The browse window is now blank.

Setting Aside Memory for the Freeze Buffer

You have the ability to specify how much of the capture buffer's memory is to be used by the freeze buffer. In other words, you can determine how much of the capture buffer can be set aside for browsing while the test is in progress.

To specify how much memory you want to set aside for the freeze buffer, do the following:

1. Click on **Setup**.

2. Select **Freeze buffer** from the open menu.

   RESULT: The Freeze buffer dialog box appears on the display (see Figure 5-3). The bar graph shows how much memory you have currently set aside.

Figure 5-3
The Freeze Buffer Dialog Box

3. Enter the amount of memory you want to allocate in the space provided. The valid range you enter is dependent on how much memory is available in the WAN Analyzer.

5.4.3 Displaying Captured Frames at the End of a Test

When you stop the WAN Analyzer and conclude the test, you can view the entire contents of the capture buffer. If the freeze buffer is disabled (i.e., the browse window is blank), all data that is currently in the capture buffer is automatically sent to the browse window.

If the freeze buffer is enabled when you stop the test, and you want to display the entire contents of the capture buffer, do the following:

1. Click on **Actions**.

2. The capture buffer should be disabled (i.e., no check mark appears next to the selection). Enable the capture buffer by selecting **Browse capture buffer** from the open menu.

   RESULT: The browse window now contains the entire contents of the capture buffer.

Note that **Browse capture buffer** is not available (i.e., is "grayed out") when a test is in progress.

5.5 PROTOCOL DECODES

Figure 5-2 (shown in Section 5.4.2) showed what captured frames look like when they are displayed in the freeze buffer (or, by association, the capture buffer). It also showed that the contents of the frame (after the header) was presented in the form of a hexadecimal frame dump. Unless you can read and understand the hexadecimal format, the information is very difficult to read and analyze.

The WAN Analyzer gives you the ability to translate (i.e., decode) the protocol in which you're working into an English language format. It also gives you the ability to apply post-capture filters to the frames in the buffer.

Sections 5.5.1 and 5.5.2 describe protocol decodes and how you can apply post-capture filters, respectively.

5.5.1 Selecting Protocol Decodes

Assume you're working with the Frame Relay link protocol and you want to decode the frames you've captured. Initiate the decode activity as follows:

1. Click on **Setup**.
2. Select **Stack Setup** from the open menu.

   RESULT: The Stack Setup dialog box appears on the display (see Figure 5-4).

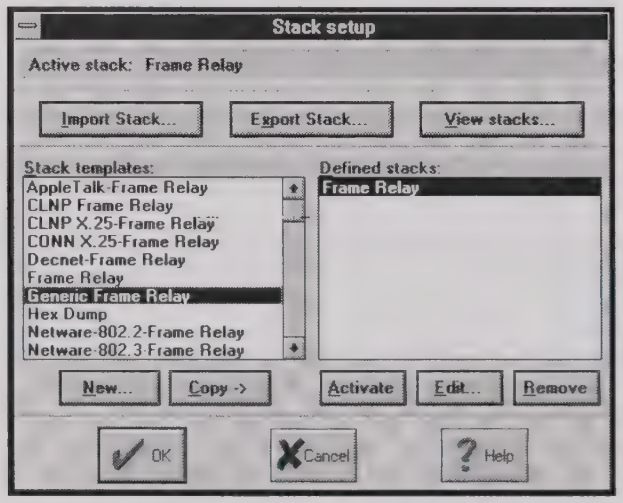


Figure 5-4
The Stack Setup Dialog Box

3. Click on Generic Frame Relay, which appears in alphabetical order in the **Stack templates** box.

   RESULT: The **Generic Frame Relay** stack template should be highlighted.

4. Click on the **Copy** button.

   RESULT: The **Generic Frame Relay** stack template is copied to, and highlighted in, the **Defined Stacks** box.

5. Click on the **Activate** button.

   RESULT: As shown in the **Active stack** bar, the **Generic Frame Relay** is now the active stack.

6. Click on **OK**.

   RESULT: The frames in the freeze or capture buffer are decoded from hexadecimal to an English-language format (see Figure 5-5).

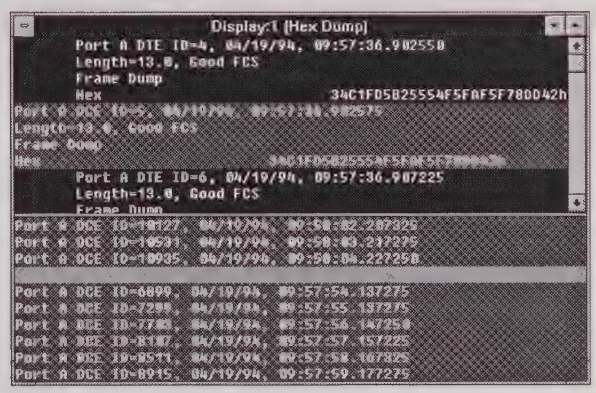


Figure 5-5
Generic Frame Relay Decodes

5.5.2 Applying Post-Capture Filtering

The WAN Analyzer gives you the ability to apply post-capture filtering (i.e., filtering beyond that specified in the Capture Task) to the frames you've already captured. Like the Capture Task's filtering, post-capture filtering enables you to display data you want to see, and eliminate the data you don't want to see.

For example, assume you're working with the Frame Relay link protocol and you want to apply post-capture filtering to **802.4**, which is the Token Bus physical architecture. Initiate the post-capture filtering activity as follows:

1. Click on **Setup**.
2. Select **Stack Setup** from the open menu.

   RESULT: The Stack Setup dialog box appears on the display.
3. Click on **Generic Frame Relay**, which appears in alphabetical order in the **Stack Template** box.

   RESULT: The **Generic Frame Relay** stack template is highlighted.
4. Click on the **New** button.

   RESULT: The **Generic Frame Relay** stack template appears in the Edit Stack screen (see Figure 5-6). Note also that the **Current Stack** box reads **Generic Frame Relay - 1**, which indicates you are working in a version of the **Generic Frame Relay** stack you can edit (i.e., use to apply post-capture filters); "canned" stack templates are "read only," and cannot be changed. Additionally, unless you save the current configuration to a file, **Generic Frame Relay - 1** will not be saved when you exit the Display Task.

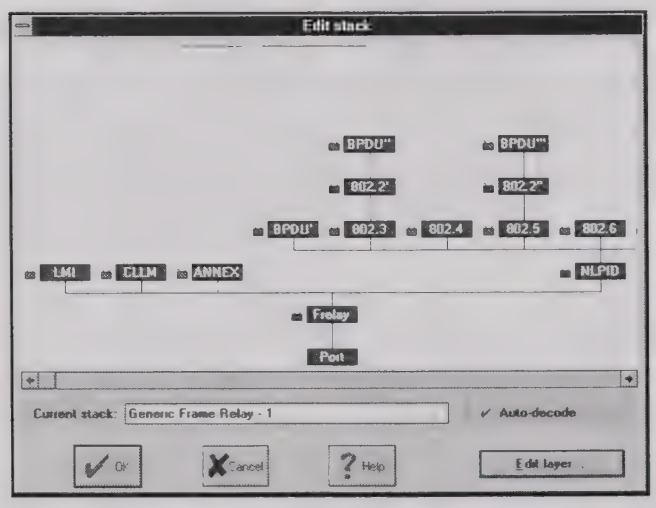


Figure 5-6
The Generic Frame Relay Stack Template

5. Point and double-click on the 802.4 icon in the stack tree.

RESULT: The 802.4 dialog box (see Figure 5-7) appears in the display.

Figure 5-7
The 802.4 Dialog Box

Table 5-1 describes the post-capture filter choices available to you. Note even though the frame filtering choices of this dialog box are specific to the token ring physical architecture, the process of applying post-capture filters in dialog boxes such as **802.4** is always the same.

Table 5-1
Post-Capture Filtering Choices (802.4)

Use:	To:
Ctl/Data Frm/Unknown	Specify the frames (by placing a check mark in the appropriate box) that will pass post-capture filtering and are available for display in the browse window. *These frames will also be passed to the next highest level in the protocol stack.* The check box of the frames you don't want to pass should be empty.
Display	Determine whether ANY frames from the 802.4 protocol are displayed in the browse window. When the box next to the **Display** label is checked, it means the frames that you've chosen to pass post-capture filtering will be displayed in the browse window; a TV icon also appears to the left of the **802.4** icon in the stack template. When the box is not checked, no frames from this protocol are displayed in the browse window.
Set all	Place check marks in all check boxes.
Clear all	Clear check marks from all check boxes.
Dest Addr	Specify frames with the destination address(es) that you enter will pass post-capture filtering and be displayed in the browse window. Up to eight addresses can be specified in a single "combo box."
Src Addr	Specify frames with the source address(es) that you enter will pass post-capture filtering and be displayed in the browse window. Up to eight addresses can be specified in a single "combo box."
Color	Access a dialog box that enables you to change the color of the text in the browse window.

5.6 TIME DELTAS

The WAN Analyzer gives you the ability to calculate time deltas. This activity allows you to see the differences in time stamps between any two frames in the freeze or capture buffer.

To calculate time deltas, do the following:

1. Click on **Setup**.
2. Enable the time delta activity by placing a check mark next to the **Time Delta** selection.

   RESULT: When positioned within the freeze or capture buffer, the cursor becomes a clock.
3. Select an anchor frame by pointing and clicking on **Actions**, then pointing and clicking on **Set Anchor Frame** in the open menu (or double-clicking on any frame in the browse window).

   RESULT: The Set Anchor Frame dialog box appears on the display.
4. When you scroll through the browse window, and each frame you pass becomes current, the time delta is updated in the information line of the display

5.7 CHOOSING A DISPLAY FORMAT

When viewing frames, you can control the amount of data that is displayed in a frame, and the way data is displayed. To choose a display format, do the following:

1. Click on **Setup**.
2. Select **Display Format** from the open menu.

   RESULT: The Display Format dialog box appears on the display (see Figure 5-8).

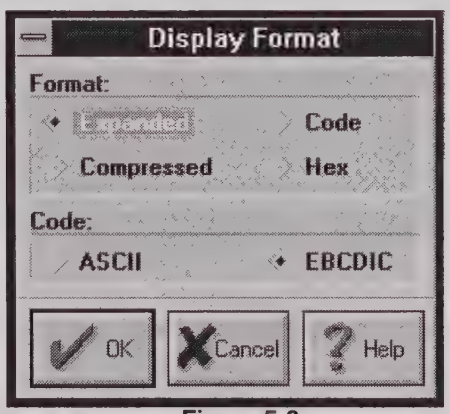


Figure 5-8
The Display Format Dialog Box

When you select **Expanded**, the browse window shows the full decoding of the frame header (see Figure 5-9). (This selection is the default.)

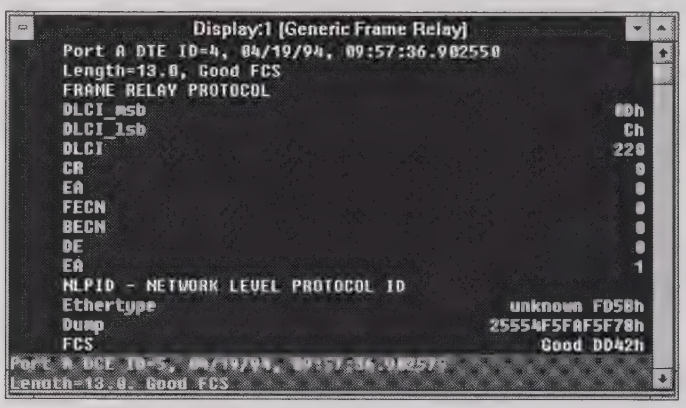


Figure 5-9
The Expanded Display Format

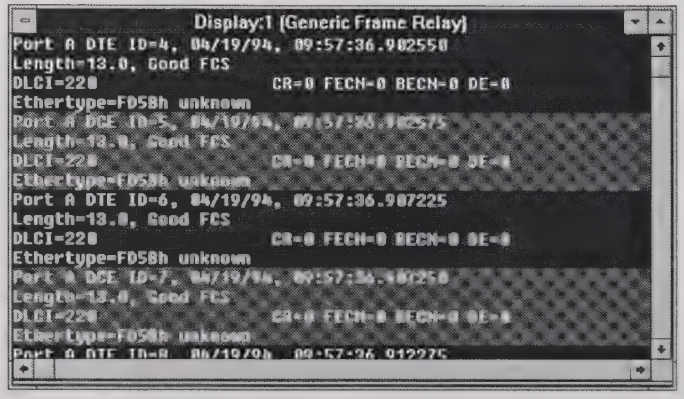


Figure 5-10
The Compressed Display Format

When you select **ASCII**, the browse window displays a frame dump in the ASCII format (see Figure 5-11). Any non-printing characters are displayed as periods (.).

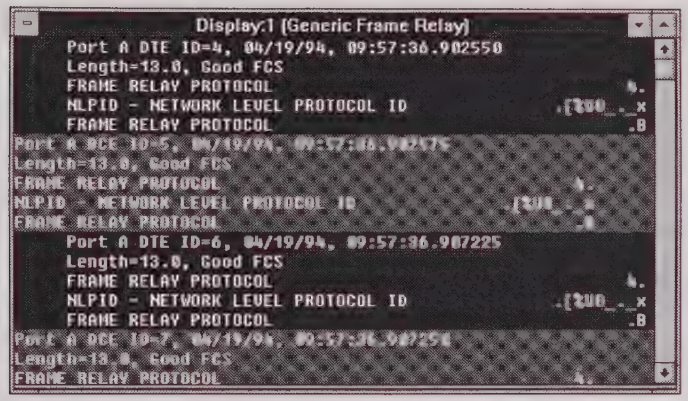

Display:1 [Generic Frame Relay]
Port A DTE ID=4, 04/19/94, 09:57:36.902550
Length=13.0, Good FCS
FRAME RELAY PROTOCOL
NLPID - NETWORK LEVEL PROTOCOL ID
FRAME RELAY PROTOCOL
Port A DCE ID=5, 04/19/94, 09:57:36.902575
Length=13.0, Good FCS
FRAME RELAY PROTOCOL
NLPID - NETWORK LEVEL PROTOCOL ID
FRAME RELAY PROTOCOL
Port A DTE ID=6, 04/19/94, 09:57:36.907225
Length=13.0, Good FCS
FRAME RELAY PROTOCOL
NLPID - NETWORK LEVEL PROTOCOL ID
FRAME RELAY PROTOCOL
Port A DCE ID=7, 04/19/94, 09:57:36.907254
Length=13.0, Good FCS
FRAME RELAY PROTOCOL

Figure 5-11
The ASCII Display Format

When you select **Hex**, the browse window displays a frame dump in the hexadecimal format (see Figure 5-12).

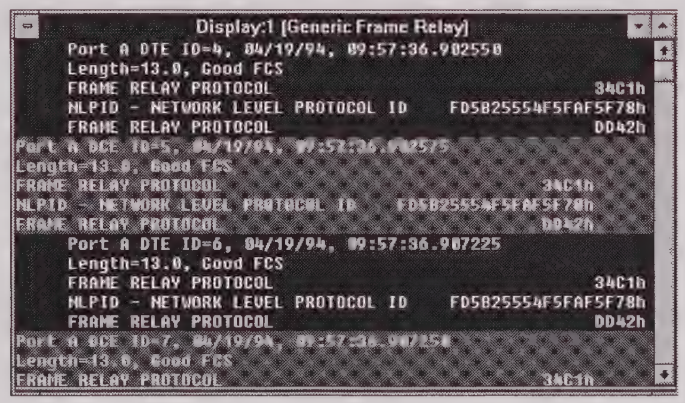

Display:1 [Generic Frame Relay]
Port A DTE ID=4, 04/19/94, 09:57:36.902550
Length=13.0, Good FCS
FRAME RELAY PROTOCOL 34C1h
NLPID - NETWORK LEVEL PROTOCOL ID FD5B25554F5FAF5F78h
FRAME RELAY PROTOCOL DD42h
Port A DCE ID=5, 04/19/94, 09:57:36.902575
Length=13.0, Good FCS
FRAME RELAY PROTOCOL 34C1h
NLPID - NETWORK LEVEL PROTOCOL ID FD5B25554F5FAF5F78h
FRAME RELAY PROTOCOL DD42h
Port A DTE ID=6, 04/19/94, 09:57:36.907225
Length=13.0, Good FCS
FRAME RELAY PROTOCOL 34C1h
NLPID - NETWORK LEVEL PROTOCOL ID FD5B25554F5FAF5F78h
FRAME RELAY PROTOCOL DD42h
Port A DCE ID=7, 04/19/94, 09:57:36.907254
Length=13.0, Good FCS
FRAME RELAY PROTOCOL 34C1h

Figure 5-12
The Hex Display Format

Note that the two-line frame header is always the same, no matter what format you choose.

5.8 MOVING THROUGH THE BROWSE WINDOW

5.8.1 Moving to the Top of the Browse Window

To move to the top of the browse window from any point in the display:

1. Click on **Actions**.
2. Select **Home** from the open menu.

Note that all scrolling keys apply to this activity.

5.8.2 Moving to the End of the Browse Window

To move to the bottom of the browse window from any point in the display:

1. Click on **Actions**.
2. Select **End** from the open menu.

Note that all scrolling keys apply to this activity.

5.8.3 Scrolling Up Through the Browse Window

To scroll *up* through the browse window, do the following:

1. Click on **Actions**.
2. Select **Previous frame** from the open menu.

   RESULT: The previous frame in the buffer is displayed at the top of the browse window.

Note that all scrolling keys apply to this activity.

5.8.4 Scrolling Down Through the Browse Window

To scroll down through the browse window, do the following:

1. Click on **Actions**.

2. Select **Next frame** from the open menu.

   RESULT: The next frame in the buffer is displayed at the top of the browse window.

Note that all scrolling keys apply to this activity.

5.8.5 Moving to a Specific Frame in the Browse Window

To move to a specific frame in the browse window, do the following:

1. Click on **Actions**.
2. Select **Goto frame** from the open menu.

   RESULT: The Goto Frame dialog box appears on the display.

3. Enter the ID of the frame to which you want to move in the box provided.

   RESULT: The frame you specified appears at the top of the display.

If the ID of the frame you specified did not pass post-capture filtering, or is a lead state event, then the frame before (or after) the one you specified appears at the top of the display.

5.9 DISPLAY-SPECIFIC ICONS

The toolbar icon offers 15 icons that are specific to the Display Task, as follows:

Icon:	Description:
	Enables you to display the Stack setup dialog box. This icon is identical in function to selecting **Stack setup** from the **Setup** menu.
	Enables you to display the Freeze buffer dialog box. This icon is identical in function to selecting **Freeze buffer** from the **Setup** menu.
	Enables you to browse (closed book) or "unbrowse" (open book) the freeze buffer. This icon is identical in function to enabling or disabling **Browse freeze buffer** in the **Actions** menu.

Icon:	Description:
	Enables you to browse the capture buffer when the Task is completed. This icon is identical in function to enabling or disabling **Browse capture buffer** in the **Actions** menu.
	Enables you to display data in the expanded format. This icon is identical in function to selecting **Expanded** in the Display Format dialog box.
	Enables you to display data in the compressed format. This icon is identical in function to selecting **Compressed** in the Display Format dialog box.
	Enables you to to display data in the hexadecimal format. This icon is identical in function to selecting **Hex** in the Display Format dialog box.
	Enables you to display data in the ASCII format. This icon is identical in function to selecting **ASCII** in the Display Format dialog box.
	Enables you to scroll up through the browse window one frame at a time. This icon is identical in function to selecting **Previous frame** from the **Actions** menu.
	Enables you to scroll down through the browse window one frame at a time. This icon is identical in function to selecting **Next frame** from the **Actions** menu.
	Enables you to move to the top of the browse window. This icon is identical in function to selecting **Home** from the **Actions** menu.
	Enables you to move to the end of the browse window. This icon is identical in function to selecting **End** from the **Actions** menu.
	Enables you to move to a specific frame in the browse window. This icon is identical in function to selecting **Goto** from the **Actions** menu.

Icon:	Description:
	Enables you to obtain a hard copy of the frame information. This icon is identical in function to selecting **Print data** from the **Actions** menu.
	Enables you to enter time delta mode. This icon is identical in function to selecting **Time deltas** from the **Setup** menu.

5.10 PROTOCOL DECODE SUITES

The WAN Analyzer offers the English language translation (i.e., decodes) of a variety of WAN and encapsulated LAN protocols. The following sections list and briefly describe the encapsulated LAN and WAN protocols that are decoded by the WAN Analyzer, respectively.

5.10.1 TCP/IP Protocol Decode Suite

ARP: Address Resolution Protocol. Maps an Internet address on the equivalent physical hardware address.

BOOTP: Bootstrap Protocol. Enables a diskless node to identify its own IP address, the address of a server, and the name of the file to be loaded and executed.

DOMAIN: Domain Name Protocol. Maps a domain name into its IP address.

FTP: File Transfer Protocol. Transfers files between devices. Controls access and negotiates file parameters and third party transfer.

ICMP: Internet Control Message Protocol. Provides the Network Layer with a means of handling error and control messages. An integral part of Internet Protocol (IP).

IP: Internet Protocol. Network Layer protocol that provides high levels with a "best effort", connectionless packet delivery service. The decode breaks out trailer-encapsulated packets at the Media Access Control (MAC) levels. Includes all IP options.

NetBIOS: Network Basic Input/Output System. Provides network services for connectionless and connection-oriented networks. Operates between the Network and Session Layers.

NFS: Network File System. Provides transparent remote access to shared file systems, operating system, network architecture, or transport protocol.

OSPF: Open Shortest Path First interior gateway protocol. An alternative routing protocol to RIP.

RARP: Reverse Address Resolution Protocol. Finds a node's Internet address from its Data Link Control address.

RIP: Routing Information Protocol. Exchanges routing information between routers, gateways, and other devices.

SMTP: Simple Mail Transfer Protocol. Transfers electronic mail from one device to another.

SNAP: Subnetwork Access Protocol. Used to place Ethertypes within LLC 802.2.

SNMP: Simple Network Management Protocol. Carries out remote management operations. The decode understands and displays parsed ASN.1 syntax.

TCP: Transmission Control Protocol. A host-level protocol that uses IP. Provides higher levels with connection-oriented reliable stream delivery. Includes all TCP options.

TELNET: The Internet standard for a virtual terminal interface to remote devices.

TFTP: Trivial File Transfer Protocol. Transfers files from one device to another. Uses UDP. Does not provide access control.

UDP: User Datagram Protocol. A host-level protocol that uses IP and adds port addressing. Like IP, it provides higher levels with a "best effort", connectionless packet delivery service.

5.10.2 AppleTalk Protocol Decode Suite

ADSP: AppleTalk Data Stream Protocol. Offers full-duplex byte streams of data.

AEP: AppleTalk Echo Protocol. Tests nodes for accessibility. Estimates the average round trip time for a typical packet.

AFP: AppleTalk Filing Protocol. Lets workstations share files across a network.

ASP: AppleTalk Session Protocol. Provides a logical relationship between two stations on the network. Provides the services that actually let them communicate.

ATP: AppleTalk Transaction Protocol. Provides a reliable datagram delivery service.

DDP: Datagram Delivery Protocol. Provides a socket-to-socket delivery service for networks made up of one or more AppleTalk LANs.

NBP: Name Binding Protocol. Converts between names and addresses on the network.

PAP: Printer Access Protocol. Provides multiple connections between workstations and servers.

RTMP: Routing Table Maintenance Protocol. Creates and maintains the routing tables used by DDP.

ZIP: Zone Information Protocol. Looks after mappings between networks and zone names.

5.10.3 DECnet Protocol Decode Suite

DAP: Data Access Protocol. Handles remote file access outside the I/O structure of the operating system being used. Controls file storage and retrieval, directory listings, etc.

DRP: DECnet Routing Protocol. The lowest-level protocol concerned with routing packets from source nodes through routers, between and within areas, and to end nodes.

NCP: Network Core Protocol. A large protocol suite that is the basis for all communication between clients and servers. NCP contains a set of service classes that look after functions such as file and directory maintenance, network management, print, queue and messages services, and transaction tracking.

NSP: Network Services Protocol. Creates and destroys logical links, and provides control over errors and traffic flow.

SCP: Session Control Protocol. Forms a bridge between end users who need logical link services and the Network Services Layer that provides the link.

5.10.4 Banyan VINES Protocol Decode Suite

ARP: VINES Address Resolution Protocol. Assigns unique Internet addresses to nodes that do not already have them.

FTP: File Transfer Protocol. Transfers files between devices. Controls access and negotiates file parameters and third party transfer.

ICP: VINES Internet Control Protocol. Provides information about routing problems and routes used.

IP: VINES Internet Protocol. A Network Layer protocol that moves packets through the network. Responsible for routing.

IPC: VINES Interprocess Communication Protocol. Provides services related to unreliable datagrams and reliable messages.

Matchmaker: Protocol used by the VINES system that provides high-level program-to-program communications and remote procedure calls.

NetBIOS: Network Basic Input/Output System. Provides network services for connectionless and connection-oriented networks. Operates between the Network and Session Layers.

RTP: VINES Routing Update Protocol. Distributes routing information.

SNAP: Sub-network Access Protocol. Permits a station to have multiple Network Layer protocols.

SPP: VINES Sequenced Packet Protocol. Provides a data stream service.

5.10.5 Novell NetWare Protocol Decode Suite

ECHO: Request and response protocol used to verify the existence of a host.

ERROR: A protocol used by a station to report receipt and disposal of a defective packet.

IPX: Internet Packet Exchange. Primarily a Transport Layer protocol that provides "best effort," connectionless datagram services. All Novell higher level decodes are built on this protocol.

NCP: Network Core Protocol. A large protocol suite that is the basis for all communication between clients and NetWare servers. NCP contains a set of service classes that look after functions such as file and directory maintenance (including Apple file systems), network management, print, queue and messages services, and transaction tracking.

NetBIOS: Network Basic Input/Output System. Provides network services for connectionless and connection-oriented networks. Operates between the Network and Session Layers.

PEP: Packet Exchange Protocol. Delivers a request and response pair.

RIP: Routing Information Protocol. Protocol used to exchange routing information among gateways.

SAP: Service Advertising Protocol. Used by servers of all classes to advertise to clients.

SPX: Sequential Packet Exchange. Novell's version of the Xerox Transport Layer protocol SPP.

5.10.6 Xerox Network System (XNS) Protocol Decode Suite

Courier: A Presentation Layer protocol that delivers printing, filing, and clearinghouse functions.

ECHO: Echo Protocol. A Network Layer protocol that enables virtual loopback testing.

ERROR: Error Protocol. A Network Layer protocol that provides error-check reporting.

IDP: Internet Datagram Protocol. Delivers a single frame to an Internet address, without regard to other packets or the addressee's response.

NBP: NetBIOS Protocol. Used in 3Com 3+ Open software.

NCP: Network Core Protocol. A large protocol suite that is the basis for all communication between clients and NetWare servers. NCP contains a set of service classes that look after functions such as file and directory maintenance (including Apple file systems), network management, print, queue and messages services, and transaction tracking.

PEP: Packet Exchange Protocol. A Transport Layer protocol that provides connection or connectionless services.

RIP: Routing Information Protocol. Exchanges routing information among gateways and end systems.

SPP: Sequenced Packet Protocol. A virtual-circuit, connection-oriented protocol.

5.10.7 ISO Protocol Decode Suite

CMIP: Common Management Information Protocol. OSI network management protocol used in DECnet Phase V.

COTP (TP0-4): Connection Oriented Transport Protocol. COTP is also known as ISO 8073.

ES-IS: End-System to Intermediate-System. Provides routing information for ISO 9542.

IS-IS: Intermediate-System to Intermediate-System. An ISO routing protocol.

802.2: Logical Link Control. Offers connectionless or connection-oriented services to higher layer protocols.

CLNP: Connectionless Network Protocol. An OSI network-layer protocol/service that does not require a circuit to be established before data is transmitted.

X.224: Transport Protocol recommendation for Open Systems Interconnection for CCITT applications.

X.225: Session Protocol recommendation for Open Systems Interconnection for CCITT applications.

SNAP: Subnetwork Access Protocol. The Internet protocol that operates between a network entity in the subnetwork and a network entity in the end system. It specifies a standard method of encapsulating IP datagrams and ARP messages on IEEE networks.

X.25: The CCITT recommendation for the interface between the DTE and DCE for terminals operating in packet mode and connected to public data networks via dedicated circuit.

X.400 P1: The CCITT 1984 protocol recommendation for electronic mail. It consists of one layer for addressing of the message's outer envelope and another layer for the inner addressing and content of the message. P1 deals with Message Transfer Protocol.

X.400 P2: The CCITT 1984 protocol recommendation for electronic mail. It consists of one layer for addressing of the message's outer envelope and another layer for the inner addressing and content of the message. P2 deals Inter-Personal Messaging Protocol.

5.10.8 IBM Systems Network Architecture (SNA) Protocol Decode Suite

802.2: Logical Link Control. Offers connectionless or connection-oriented services to higher layer protocols.

NetBIOS: Network Basic Input/Output System. Provides network services for connectionless and connection-oriented networks. Operates between the Network and Session Layers.

QLLC: Qualified Logical Link Control. Provides the interface between X.25 and the SNA group of protocols.

SDLC: Synchronous Data Link Control. A result of IBM's participation in the work of the International Standards Organization to define new data link control procedures.

5.10.9 3Com Protocol Decode Suite

IDP: Internetwork Datagram Protocol. The Xerox Internetwork protocol.

NBP: NETBIOS Protocol, LAN Manager/3Com 3+ Open protocol.

SPP: Sequenced Packet Protocol. The Xerox Transport Layer protocol.

5.10.10 IBM PC LAN Protocol Decode Suite

NetBIOS: Network Basic Input/Output System. Provides network services for connectionless and connection-oriented networks. Operates between the Network and Session Layers.

5.10.11 Sun Network File System (NFS) Protocol Decode Suite

NFS: Network File System. Provides transparent remote access to shared file systems, operating system, network architecture, or transport protocol.

RPC: Remote Procedure Call. A protocol for activating a function on a remote station and retrieving the result.

5.10.12 Local Area Network (LAN) Protocol Decode Suite

802.3: Local Area Network topology with Carrier Sense Multiple Access/Collision Detection access, commonly referred to as Ethernet.

802.4: MAP, the Token Bus physical architecture.

802.5: The ring topology with token-passing access protocol, known conventionally as Token Ring.

802.6: The IEEE Metropolitan Area Network standard, also known as Distributed Queue Dual Bus (DSQB).

FDDI: Fiber Distributed Data Interface. ANSI standard for Fiber Optic LANs, it is compatible with the standards for the Physical Layer of the OSI.

5.10.13 Frame Relay Protocol Decode Suite

Annex A: Frame Relay Network-to-Network Interface Signaling Specification.

Annex D: Frame Relay Bearer Service.

ARP: Address Resolution Protocol. A protocol within TCP/IP that maps IP addresses to Ethernet addresses.

BPDU: Bridge Protocol Data Unit. Used with the 802.1 spanning tree routing algorithm.

CLLM: Consolidate Link Layer Management. ANSI-defined signaling method where one of the DLCIs (number 1023) on a Frame Relay interface is reserved for sending Link Layer management messages from the network to the user device.

LMI: Local Management Interface. A Frame Relay specification that defines the method for exchanging status information between user devices (e.g., router) and the network.

NLPID: Network Layer Protocol Identifier.

SNAP: Subnetwork Access Protocol. Used to place Ethertypes within Logical Link Control 802.2 connection and multiplexing protocol.

5.10.14 Integrated Services Digital Network (ISDN) Protocol Decode Suite

LAPD: Link Access Protocol for the ISDN D channels. Defines the function of the Data Link Layer of ISDN D channels. Although primarily used for basic and primary rate interfaces, LAPD is also the basic frame format for Frame Relay.

Q.931: The CCITT recommendation that describes the Layer 3 signaling procedure protocol stack. Primarily used for basic and primary rate interfaces. Q.931 recommendations supported are:

AT&T
Northern Telecom - both functional and stimulus modes
CCITT Australia (TPH 1856 & 1962)
1TR6 - Germany
VN2 - France

V.120: CCITT recommendation that describes how a regular V-series DTE interface can connect to, and communicate with, the ISDN B channel. Also called *bit rate adaption.*

5.10.15 Switched Multi-megabit Data Service (SMDS) Protocol Decode Suite

ARP: Address Resolution Protocol. Maps an Internet address on the equivalent physical hardware address.

DXI: Data Exchange Interface. Defines the interaction between internetworking devices and DSU/CSUs that transmit over a SMDS access line.

IP: Internet Protocol. Network Layer protocol that provides high levels with a "best effort," connectionless packet delivery service. The decode breaks out trailer-encapsulated packets at the Media Access Control (MAC) levels. Includes all IP options.

LMI: Local Management Interface. A specification that defines the method for exchanging status information between user devices (e.g., router) and the network.

PLCP: Physical Layer Convergence Procedure. Adapts the services of the transmission system to provide uniform, generic service to the Data Link Layer.

SIP L2: Bellcore standard for the Data Link Layer. Generic system requirements in support of SMDS.

SIP L3: Bellcore standard for the Network Layer. Generic system requirements in support of SMDS.

SNAP: Subnetwork Access Protocol. Used to place Ethertypes within Logical Link Control 802.2 connection and multiplexing protocol.

5.10.16 Systems Network Architecture (SNA) Protocol Decode Suite

QLLC: Qualified Logical Link Control Protocol. Provides the interface between X.25 and the SNA protocol suite.

ELLC: Enhanced Logical Link Control. An IBM recommendation that describes the format and procedures for encapsulating SNA within X.25. Used over public data networks.

SDLC: Synchronous Data Link Control. A result of IBM's participation in the work of the International Standards Organization to define new data link control procedures.

SNA-RH: SNA Request/Response Header.

SNA-RU: SNA Request/Response Unit.

SNA-TH: SNA Transmission Header.

5.10.17 X.25 Protocol Decode Suite

X.25: The protocol that provides devices with a direct connection to a packet switched network.

HDLC: High-Level Data Link Control. A bit-oriented Data Link Layer protocol, in which control codes differ according to their bit positions and patterns.

LAP-B: Link Access Procedure - Balanced. A full-duplex, point-to-point, bit-synchronous protocol.

ADCCP: Advanced Data Communications Control Procedures. A bit-oriented Data Link Layer protocol. ADCCP is ANSI's version of SDLC/HDLC.

5.10.18 Link Layer Protocols

PPP: Point to Point Protocol. A Data Link Layer protocol that bypasses X.25 for communicating between systems that are directly connected, running a variety of protocols directly over HDLC.

Cisco HDLC: Cisco proprietary HDLC-like protocol used for encapsulating LAN protocols on the wide area.

5.10.19 ATM Protocol Decode Suite

T1 ATM: T1 Asynchronous Transfer Mode protocol used to decode PLCP frames with ALL5 format.

SECTION 6
THE STATISTICS TASK

6.1 SECTION SUMMARY

This section of the manual gives you detailed information about the WAN Analyzer's Statistics Task. It describes all of the following:

- How to display statistics on the protocol you are testing.
- The activities associated with gathering statistics.
- How you can perform these activities.

6.2 STATISTICS TASK OVERVIEW

The Statistics Task gives you the ability to accumulate, display, and log key statistics (e.g., link utilization, frame count, etc.) for the link protocol you are testing. Statistics go beyond the information you obtain when capturing and decoding packets (in the Display Task) to give you a broad look at conditions within the network.

6.2.1 What You Can Do in the Statistics Tasks

The general activities you can perform in the Statistics Task are as follows:

1. Entering the Statistics Task.
2. Selecting the source of the statistics — ports or a log file.
3. Setting up a tabular and/or graphic display for the statistics.
4. Logging the statistics to a file.
5. Enabling, triggering, or freezing the collection of statistics.
6. Stepping through a log file, when a log file is the source of the statistics.
7. Resetting statistics counters while the test is in progress.
8. Disabling the collection of statistics.

9. Obtaining a hard copy (i.e., printing) of the statistics.

10. Choosing a tabular font and grid color.

11. Choosing graph colors.

6.2.2 Available Statistics

The statistics that can be collected depends on the link protocol you have selected in the WAN Port Configuration dialog box, as follows:

ADCCP/HDLC

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
INFO Frames
Supervisory Frames
RR Frames
RNR Frames
REJ Frames
SREJ Frames
SABM Frames
SABME Frames
DISC/RD Frames
UA Frames
DM/SARM Frames
SARME Frames
SNRM Frames
SNRME Frames
FRMR/CMDR Frames
RSET Frames
XID Frames
UI Frames
RIM/SIM Frames
TEST Frames
UP Frames

SNA/SDLC

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
INFO Frames
RR Frames
RNR Frames
REJ Frames
Unnumbered Frames
SNRM Frames
SNRME Frames
DISC/RD Frames
UA Frames
DM Frames
FRMR Frames
XID Frames
RIM/SIM Frames
TEST Frames
UI Frames
UP Frames
BCN Frames
CFGR Frames
Supervisory Frames

X.25/LAPB

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
INFO Frames
Supervisory Frames
RR Frames
RNR Frames
REJ Frames
Unnumbered Frames
SABM Frames
SABME Frames
DISC Frames
UA Frames
DM Frames
FRMR Frames

ADCCP/HDLC (con't)

BCN/SABMR Frames
CFGR Frames
NR0 Frames
NR1 Frames
NR2 Frames
NR3 Frames
S10 Frames
S11 Frames
Unnumbered Frames

ISDN/LAPD

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
INFO Frames
Supervisory Frames
RR Frames
RNR Frames
REJ Frames
Unnumbered Frames
SABM Frames
SABME Frames
DISC Frames
UA Frames
DM Frames
FRMR Frames
XID Frames
S10 Frames
S11 Frames

Frame Relay

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
BECN Frames
FECN Frames
DE Frames
16 Most Recently Active DLCIs

PPP

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
Total PPP/LAN Type Packets
IP Packets
OSI Network Layer Packets
XNS/IDP Packets
DecNet Packets
AppleTalk Packets
AppleTalk EDDP Packets
AppleTalk Smart Buffered Packets
IPX Packets
Banyon Vines Packets
Luxcom Packet
Sigma Network Systems Packets
VJ Compressed TCP/IP Packet
VJ Uncompressed TCP/IP Packets
Bridging PDUs
Stream Protocol (ST-II) Packets
Multilink Protocol Packets

SMDS/DXI

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
UI Frames
Test Frames

Compression Protocol Packets
Padding Protocol Packets
802.1 Hello Packets
IBM Source Routing BPDUs
Total PPP/LAN Cntrl. Msgs.
IP Control Msgs.
OSI Network Layer Cntrl. Msgs.
XNS/IDP Control Msgs.
DecNet Control Msgs.
AppleTalk Control Msgs.
IPX Control Msgs.
Banyon Vines Control Msgs.
Bridging NCP Msgs.
Stream Protocol Cntrl. Msgs.
Multilink Cntrl. Protocol Msgs.
Compression Cntrl. Protocol Msgs.
PPP Link Cntrl. Protocol Msgs.
PPP Password Authentication Msgs.
PPP Link Quality Report Msgs.
PPP Challenge Handshake Msgs.

Cisco

Link Utilization
Total Frames
Frames with Good FCS
Valid Frames
Invalid Frames
Undefined Frames
Undecodable Frames
Frames with Bad FCS
Aborted Frames
Overlength Frames
Total Ethernet Packets
PUP Packets
XNS/IDP Packets
IP Packets
CHAOSnet Packets
IEEE Spanning Tree Packets
DECNET Packets
IEEE 802.3 Bridging PDUs
Apollo Domain Packets
cisco SLARP Packets
APPLETALK ARP Packets

T1 ATM

Link Utilization
PLCP Frames
PLCP OOF Events
PLCP Frames with BPV
Total Numbers of BIP-8 Errors
PLCP Frames with Invalid FEBE Count
Sum of Valid Received FEBE Counts
Last Reported Yellow Alarm Signal
Last Reported Link Status Signal
Total ATM Cells
Cells with Invalid HEC
Cells with Valid HEC
Idle Cells
Unassigned Cells
Assigned Cells
Assigned Cells with User Data
Assigned Cells with Segment OAM F4 Data
Assigned Cells with End-to-End OAM F4 Data
Assigned Cells with Segment OAM F5 Data
Assigned Cells with End-to-End OAM F5 Data
Assigned Cells with Reserved Payload Type

IPX Packets	Assigned Cells with CLP=0
ISO CLNP/ESIS Packets	Assigned Cells with CLP=1
Other Ethertype Packets	User Cells with Congestion Not Experienced
	User Cells with Congestion Experienced
	User Cells with SDU_Type=0
	User Cells with SDU_Type=0
	User Cells with SDU_Type=1
	Percentage of Total Cells which are Assigned
	Percentage of Assigned Cells with CLP=1
	Percentage of Assigned Cells with User Data
	Percentage of User Cells with Congestion Experienced

NOTE: This manual assumes familiarity with the link protocol you are testing. Please consult the appropriate CCITT recommendation for more information.

6.2.3 How Link Utilization Statistics are Collected

To compute the link utilization statistics that are available with all protocols, the WAN Analyzer collects the following information:

1. The number of data bits received.

2. The number of channel bits received.

The number of data bits is defined as the number of bits within a received frame, excluding flags and zero bits inserted for transparency. This definition also excludes bits that are received outside of frame boundaries (i.e., while the HDLC receiver is in "sync hunt" mode).

The number of channel bits is defined as the number of data clock edges presented to the WAN Analyzer by the transmission interface. Note that this definition does not include bits used for physical layer alignment (i.e., T1 framing bits).

6.2.4 When Statistics are Collected

All statistics are collected *before* capture filters are applied.

6.3 ENTERING THE STATISTICS TASK

To enter the Statistics Task, click on **Task** in the WAN Analyzer Main Menu, then click on **Statistics** from the open menu. After doing so, two things occur, as shown in Figure 6-1:

- **Setup** and **Actions** appear as choices in the Main Menu.
- If you haven't recalled a previous set of tabular or graphical criteria from a configuration file, the opening **Statistics** screen is blank.

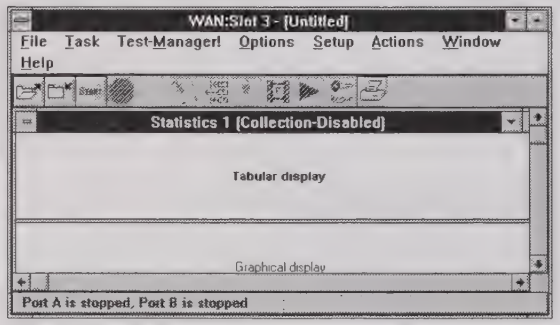


Figure 6-1
Entering the Statistics Screen

6.3.1 If The Statistics Task Cannot Be Selected ...

If **Statistics** cannot be selected (i.e., "grayed out") from the **Task** menu, it is most likely because of the following:

1. You elected to capture data FROM DISK in the Capture Mode Setup screen; statistics can only be gathered on data captured in real time. To change the capture mode, do the following:

   a. Click on **Task**, then select **Setup** from the **Task** menu.

      RESULT: A submenu appears to the right of the **Task** menu.

   b. Click on **Capture Mode**.

      RESULT: The Capture Mode Setup dialog box appears on the display.

   c. Change the **Captured Data** setting from **From Disk** to **To Memory**.

   d. Click on **OK**.

2. The **Statistics** Task may already be open. You can verify this by arranging the open Tasks by title, as follows:

   a. Click on the **Window** menu selection.

      RESULT: The **Window** menu choices are displayed on the screen.

   b. Click on **Cascade**.

6.3.2 The Two Sections of the Statistics Screen

The Statistics screen contains two sections — the top section is reserved for the tabular display, and the bottom section is reserved for the graphical display; both displays will contain statistical information once you have set up the tabular and graphical criteria for the Task you want to run. Additionally, the Statistics screen can be adjusted so either the tabular or graphic display occupies the entire area, or one display has a larger viewing area than the other. (This activity is described in Section 6.3.3).

The title bar of the opening screen reads **Statistics 1**; if desired, you can also open a second screen (**Statistics 2**), which would enable you to display as many as four unique sets of statistics (i.e., two graphical and two tabular). Section 6.3.4 describes this activity in detail.

6.3.3 Adjusting the Statistics Screens

At any time during the Task, you can adjust the Statistics screen so either the tabular or graphical display occupies the entire area, or one display has a larger viewing area than the other. To adjust the Statistics screen, do the following:

1. Use the trackball to position the cursor on the horizontal line that divides the two displays. When positioned correctly, the cursor becomes a small black double arrow, indicating that the line can now be moved up or down.

2. After clicking and holding on the horizontal line using the **Trackball** button, use the trackball to drag the line up or down, as desired.

   EXAMPLE: Assume you won't be setting up tabular statistics during the Task, and you want the graphic display to occupy the entire screen. Use the trackball to position the pointer on the horizontal line. When the pointer becomes a double arrow, click and hold on the line, then use the trackball to drag the line UP until it reaches the bottom of the title bar, at which time you can release the **Trackball** button. After doing so, the Statistics screen should look like the one shown in Figure 6-2.

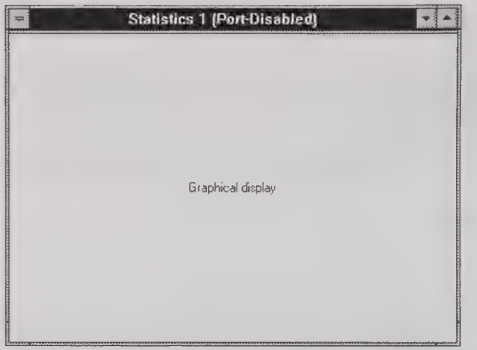


Figure 6-2
Adjusting the Screen So Only the Graphical Display is Visible

6.3.4 Opening a Second Statistics Screen

If you want to display four unique sets of statistics (i.e., two tabular and two graphical), two Statistics screens can be open during any given test. To open a second screen (labeled **Statistics 2** in the menu bar), do the same thing you did to enter the **Statistics** Task; click on **Task** in the WAN Analyzer Main Menu, then click on **Statistics** from the open menu.

6.3.5 Viewing the Statistics 1 and Statistics 2 Screens Simultaneously

After setting up both screens for the test you want to run, you may find it useful to display the **Statistics 1** and **Statistics 2** screens simultaneously so you can view all of the statistics you have accumulated at the same time. You can do this as follows:

1. Click on **Window** in the WAN Analyzer Main Menu.
2. Select **Tile** from the open menu.

6.4 SELECTING A SOURCE OF STATISTICS

The data that will serve as the source of the statistics can originate from the WAN Analyzer ports (A or B), or a log file. You can make this selection using the Source Options dialog box, which you can access by doing the following:

1. Click on **Setup** in the WAN Analyzer Main Menu.
2. Select **Source** from the open menu.

   RESULT: The Source Options dialog box appears on the display.

Note that **Source** is not available (i.e., "grayed out") when the collection of statistics is enabled (see Section 6.8).

Table 6-1 describes each choice in the Source Options dialog box.

Table 6-1
Source Option Choices

Use:	To:
Ports	Choose WAN Analyzer ports as the source of statistics. A black dot in the center of the diamond indicates that **Ports** is the current source option.
Log file	Choose a log file as the source of statistics. A black dot in the center of the diamond indicates that **Log file** is the current source option. In such instances, note that the **File selection** button, which gives you access to the Select Source Log File dialog box, also becomes selectable.
Interval length	Choose a time interval that statistical information will be gathered and updated. Click on the arrow to open the box containing the time intervals available to you, which range from 1 second to 24 hours. To choose a time interval, simply click on the desired selection.
Log file	View the name of the log file that will be used as the source of statistics. Note that this box can only be used as a display.
File selection	Enter the Select Source Log File dialog box, where you can specify the name and location of the log file will be used as the source of statistics. This button is not available (i.e., grayed out) when **Ports** is the current source option.
OK	Exit and save the values you set in the dialog box, and return to the Statistics screen.
Cancel	Exit and cancel the values you set in the dialog box, and return to the Statistics screen.

6.5 DISPLAYING STATISTICS IN A TABULAR FORMAT

Within this Task, you have the ability to display the statistics of the choice in a tabular format. For example, Figure 6-3 shows a series of key ADCCP/HDLC statistics displayed in a table.

NOTE: If desired, you can display a subset of these statistics (i.e., a maximum of two) in the graphical format (see Figure 6-14). Also remember you can choose to display an entirely different set of statistics than the ones you have selected for the graphical display, or choose not to use the tabular display at all. (See Section 6.3.3 to learn how to remove the tabular display from view.)

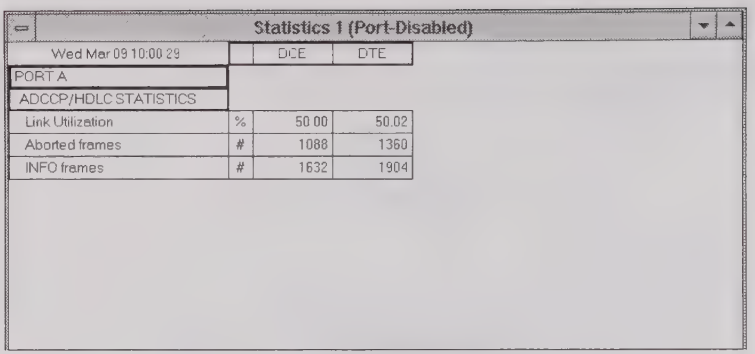


Figure 6-3
Sample Tabular Display

6.5.1 Getting Started

To begin setting up the tabular display, do the following:

1. Click on **Setup** in the WAN Analyzer Main Menu.
2. Select **Tabular display** from the open menu.

   RESULT: The Tabular Display Setup dialog box appears on the display.

Note that **Tabular display** is not available (i.e., grayed out) when the collection of statistics is in progress (see Section 6.8).

6.5.2 Setting Up the Tabular Display

Almost all the steps in setting up a tabular display are performed in the Tabular Display Setup dialog box (as shown in Figure 6-4).

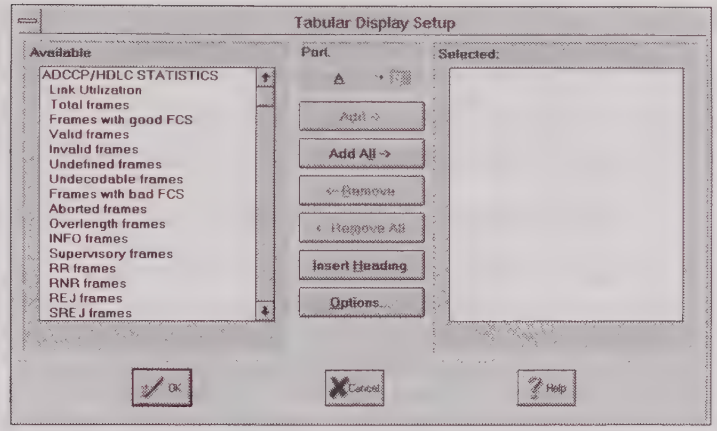


Figure 6-4
The Tabular Display Setup Dialog Box

Table 6-2 fully describes each choice in the Tabular Display Setup dialog box.

Table 6-2
Tabular Display Setup Choices

Use:	To:
Port	Identify the port to which the statistics in the tabular display will apply (A or B). If you are performing a Statistics Task using dual ports (e.g., X.25/LAPB on Port A and Frame Relay on Port B), you can set up a tabular display for both link protocols, or, if desired, display one set of protocol statistics in a table and the other in a graph. If you are performing a Statistics Task using a single port, the port you are not working with is not available (i.e., grayed out) as a choice.
Available	View the list of the statistics you can include in the tabular display. Remember the statistics that are available to you are based on the link protocol you selected in the WAN Port Configuration dialog box (see Section 6.2.2).
Selected	View the statistics that you have are including in the tabular display. Note that this box is empty when you have entered the **Statistics** Task for the first time in a WAN Analyzer session (unless you have recalled a set of selected statistics from a configuration file).

Table 6-2
Tabular Display Setup Choices (Continued)

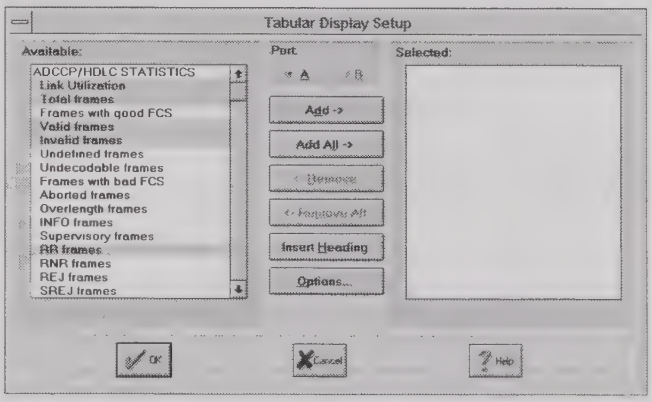
Use:	To:
Add	Choose one or more statistics to include in the tabular display, as follows: 1. In the **Available** box, click on each of the statistics you want to include. **RESULT:** The statistics you have individually clicked on are highlighted. For example, Figure 6-5 shows what the **Available** box would look like if you selected Link Utilization, Total frames, Valid frames, Invalid frames, and RR frames.  **Figure 6-5** **Choosing the Statistics To Include in The Tabular Display** 2. Click on the **Add** button. **RESULT:** The statistics you highlighted are moved (i.e., added) to the **Selected** box, and will be included in the tabular display. Note that the **Add** button is not available (i.e., grayed out) until you have highlighted a statistic in the **Available** box. Also note that, in lieu of using the **Add** button, you can double-click on the individual statistic of the choice to send it to the **Selected** box.

Table 6-2
Tabular Display Setup Choices (Continued)

Use:	To:
Add All	Include all available statistics in the tabular display, as follows: 1. Click on the **Add All** button. **RESULT:** All statistics in the **Available** box are moved (i.e., added) to the **Selected** box, and will be included in the tabular display; as a result, the **Available** box is empty. Note that the **Add All** button is not available (i.e., grayed out) when the **Available** box is empty. Note that you can also "add all" by double-clicking on the link protocol banner (e.g., ADCCP/HDLC Statistics) in the **Available** box.
Remove	Choose one or more currently selected statistics for removal from the tabular display, as follows: 1. In the **Remove** box, click on each of the statistics you want to remove from the tabular display. **RESULT:** The statistics you have individually clicked on are highlighted. For example, Figure 6-6 shows what the **Selected** box would look like if you chose RR frames and RNR frames for removal.

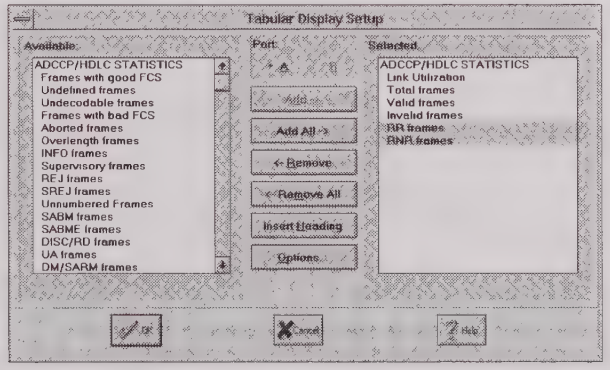


Figure 6-6
Choosing the Statistics To Remove From The Tabular Display

Table 6-2
Tabular Display Setup Choices (Continued)

Use:	To:
	2. Click on **Remove**. **RESULT:** The statistics you highlighted are removed from the **Selected** box, and returned to the **Available** box; these statistics will *not* be included in the tabular display. Note that the **Remove** button is not available (i.e., grayed out) until you have highlighted a statistic in the **Selected** box. Also note that, in lieu of using the **Remove** button, you can double-click on the individual statistic of the choice to return it to the **Available** box.
Remove All	Delete all currently selected statistics from the **Selected** box, and return them to the **Available** box, as follows: 1. Click on **Remove All**. **RESULT:** All statistics in the **Selected** box are moved (i.e., deleted) from the **Selected** box, and are returned to the **Available** box; as a result, the **Selected** box is empty. Note that you can also "remove all" by double-clicking on the link protocol banner (e.g., ADCCP/HDLC Statistics) in the **Selected** box.
Insert Heading	Insert a heading above any area in the tabular display. For example, if you want to insert a heading that shows the name of the individual performing the Statistics Task and where the Task took place, do the following: 1. Before specifying a heading, add all of the statistics you want to include in the tabular display to the **Selected** box. 2. Since the heading you want to specify (i.e., name and location) applies to all of the statistics in the tabular display, click on the first statistic in the **Selected** box. **RESULT:** That statistic is highlighted. 3. Click on **Insert Heading**. **RESULT:** The Insert Heading dialog box appears on the display.

Table 6-2
Tabular Display Setup Choices (Continued)

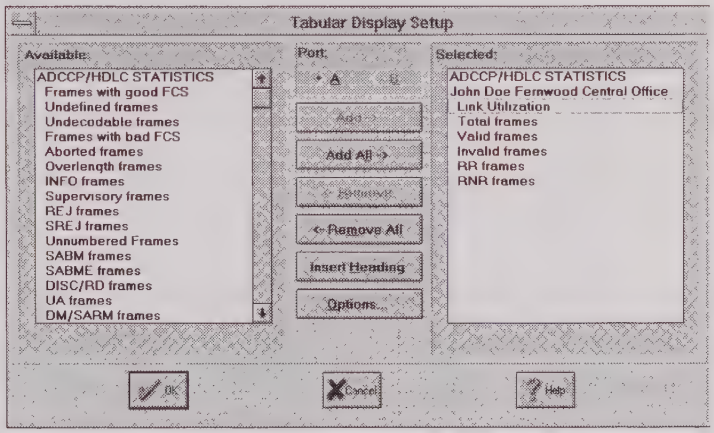
Use:	To:
	4. Type the heading using as many characters as you require, then click on **OK**. Assume you've typed the name (John Doe) and the location of the Task (Fernwood Central Office). **RESULT:** The heading you typed appears above the statistic you highlighted in the **Selected** box (as shown in Figure 6-7).  **Figure 6-7** **Inserting a Heading** To delete any heading you have inserted, simply click on that heading, then click on the **Remove** button.

Table 6-2
Tabular Display Setup Choices (Continued)

Use:	To:
Options	Customize the format of the tabular display. To get started, click on the **Options** button to access the Tabular Display Options dialog box (see Figure 6-8).

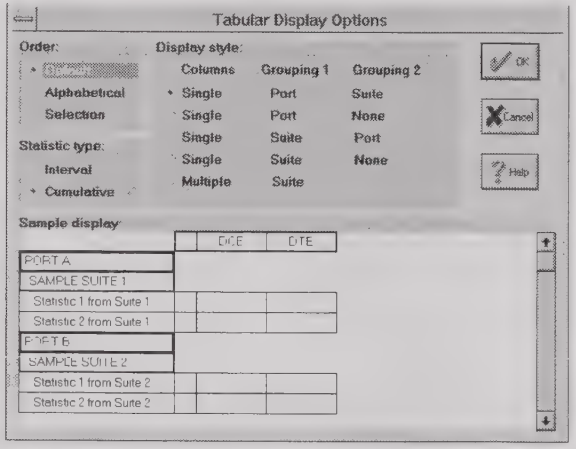


Figure 6-8
The Tabular Display Options Dialog Box

The choices available to you in the Tabular Display Options dialog box are:

a. **Order** enables you to determine the order in which the statistics will appear in the tabular display.

   1. **Default** enables you to display the statistics in the order in which they appear in the **Available** box (no matter what order you placed them in the **Selected** box).

      When you choose **Default**, all displays styles are available to you.

   2. **Alphabetical** enables you to display the statistics in alphabetical order.

      When you choose **Alphabetical**, only the **Single Port None** display style is available; all others are grayed out. Additionally, the link protocol banner normally positioned at the top of the **Available** and **Selected** boxes is not displayed.

Table 6-2
Tabular Display Setup Choices (Continued)

Use:	To:
	3. **Selection** enables you to display the statistics in the order in which they appear in the **Selection** box (no matter what order they appear in the **Available** box). When you choose **Selection**, only the **Single Port None** display style is available; all others are grayed out. b. **Statistics type** enables you to determine the way in which the statistics are updated. 1. **Interval** enables the statistical results to only reflect a single interval — the one you specified in the Source Options dialog box (see Section 6.4). In other words, the result total does not accumulate with each succeeding interval. 2. **Cumulative** adds the statistical results of the latest interval to all previous totals. In other words, the result total does accumulate with each succeeding interval. c. **Display style** enables you to choose the tabular display format that is most appropriate for the Task requirements. To sample any of the six display styles available to you, click on the diamond to the left of style you want to see. **RESULT:** The style you select appears in the **Sample display** box. Note that all six displays are available only when you select the **Default** order.

After Setting Up The Tabular Display...

Assume, for example, you've selected link utilization, total frames, valid frames, and invalid frames as the ADCCP/HDLC statistics you want to display for Port A; also assume you've inserted the heading John Doe, Fernwood Central Office as the heading. When doing so, the Tabular Display Setup dialog box looks like the one shown in Figure 6-9.

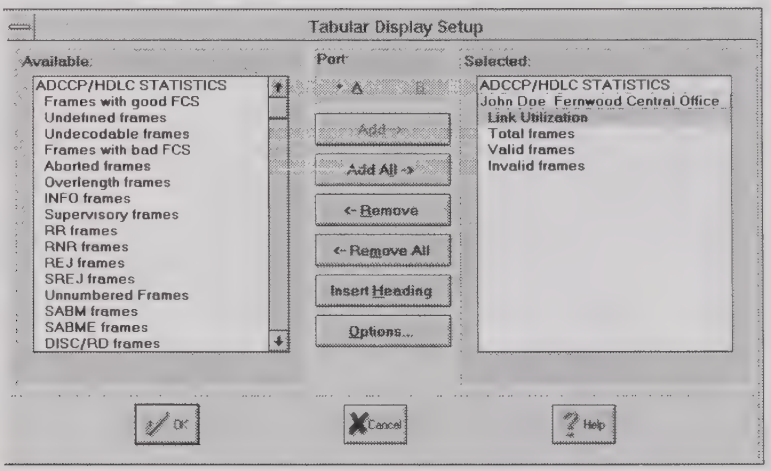


Figure 6-9
Sample Tabular Display Setup Dialog Box

Additionally, you have already entered the Tabular Display Options dialog box, and chosen the **Single Suite Port** display style, as shown in Figure 6-10.

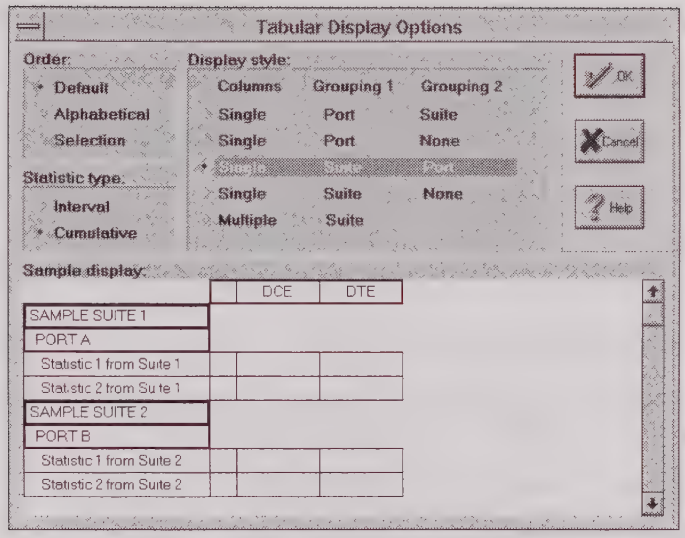


Figure 6-10
Sample Tabular Display Options Dialog Box

After you have set up all the parameters of the tabular display as shown in Figures 6-9 and 6-10, and after pointing and clicking on **OK** in the Tabular Display Setup dialog box, you will see the tabular display on the Statistics screen looks like the one shown in Figure 6-11.

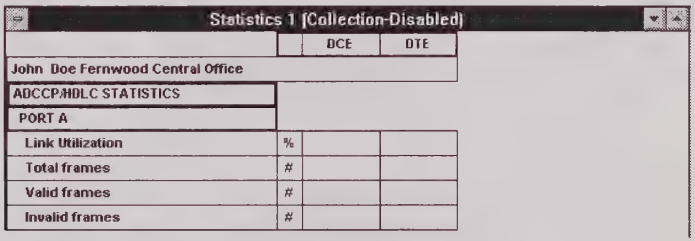


Figure 6-11
Resulting Tabular Display

Note that the percent sign (%) in the column to the right of Link Utilization indicates this result is a percentage; the pound sign (#) to the right of Total frames, Valid frames, and Invalid frames indicates these results are total counts.

6.5.3 Choosing a Font for the Tabular Display

The WAN Analyzer gives you the ability to choose a font, as well as various style and size options, for the tabular display. You can choose all of the following:

- Font
- Font style (i.e., regular, bold, and/or italic)
- Font size
- Effects (i.e., strikeout and/or underline)
- Color

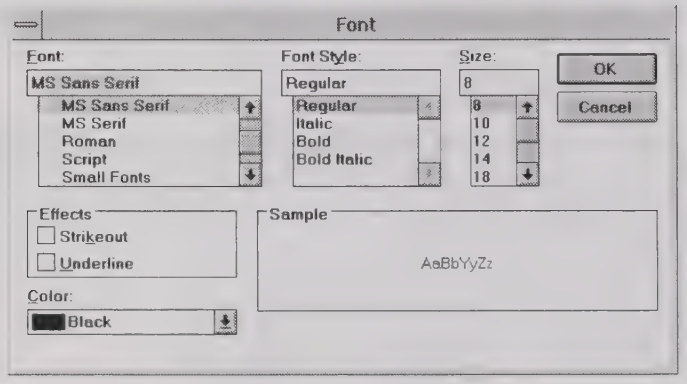
To choose a font for the tabular display, do the following:

NOTE: Although it is not required, it is recommended that you have already set up the tabular display, and it is visible on the Statistics screen.

1. From the Statistics screen, click on **Setup**.
2. Select **Tabular font** from the open menu.

   RESULT: The Font dialog box appears on the display (as shown in Figure 6-12).

Figure 6-12



The Font Dialog Box

3. Complete each item in the dialog box as desired. The **Sample** box shows what the sum total of the settings will look like once you put them into effect.
4. When you have selected the right combination of font, style, size, color, and (if desired) effect, click on **OK** to put these settings into effect in the tabular display, or click on **Cancel** to leave the previous settings intact.

6.5.4 Choosing a Grid Color for the Tabular Display

The WAN Analyzer gives you the ability to choose a grid color for the tabular display, as follows:

NOTE: Although it is not required for choosing a grid color, it is recommended that you have already set up the tabular display, and it is visible on the Statistics screen.

1. From the Statistics screen, click on **Setup**.
2. Select **Tabular grid color** from the open menu.

   RESULT: The Color dialog box appears on the display (as shown in Figure 6-13).

Figure 6-13
The Color Dialog Box

3. Select the grid color of the choice, then click on **OK** to put the selection into effect in the tabular display, or click on **Cancel** to leave the previous settings intact.

Note that black is the default grid color (i.e., the first color box on the last line of the dialog box); if you want to eliminate the grid lines from the tabular display, click on the last color box on that line. Also note that custom colors cannot be specified.

6.6 DISPLAYING STATISTICS IN A GRAPHICAL FORMAT

In addition to the tabular format, you have the ability to display a maximum of two statistics of the choice in a graphical format. The statistics you display graphically are also broken down by source, which gives you a total of four individual statistics. For example, Figure 6-14 shows two of the series of ADCCP/HDLC statistics (link utilization and total frames) are displayed in the graphical format, and these statistics are shown individually for each source (i.e., DTE and DCE).

When two statistics have the same measurement units (e.g., total number) only one vertical axis appears on the left side of the graph; when two statistics have different measurement units (e.g., total frames, which is measured by total number, and link utilization, which is measured by percent), a vertical axis appears on each side of the graph (as shown in Figure 6-14).

If desired, you can choose to display a different set of statistics than the ones you selected for the tabular display, or choose not to use the graphical display at all. (See Section 6.3.3 to learn how to remove the graphical display from view.)

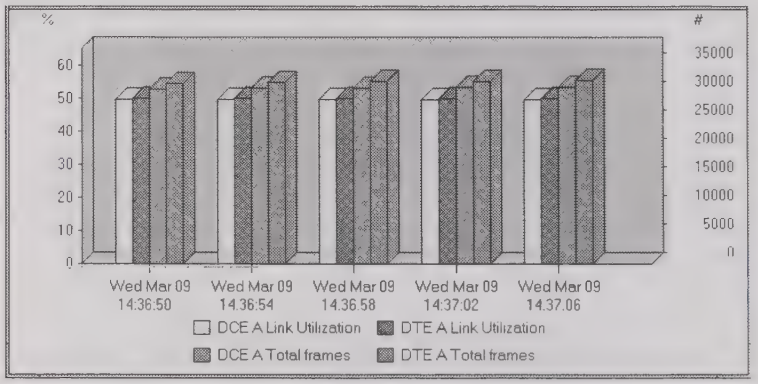


Figure 6-14
Sample Graphical Display

6.6.1 Getting Started

To begin setting up the graphical display, do the following:

1. Click on **Setup** in the WAN Analyzer Main Menu.
2. Select **Graphical display** from the open menu.

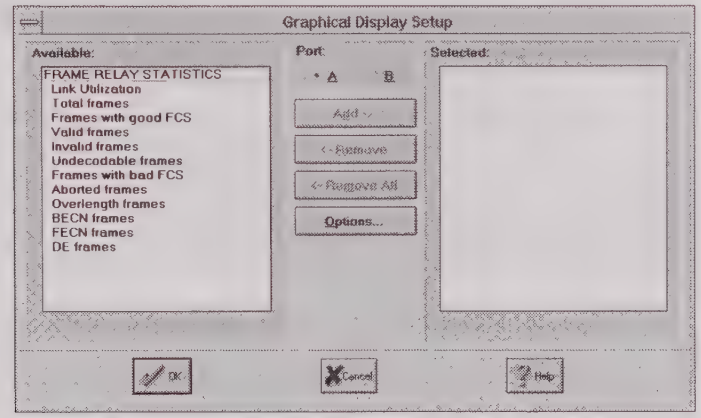
   RESULT: The Graphical Display Setup dialog box appears on the display.

Note that **Graphical display** is not available (i.e., grayed out) when the collection of statistics is enabled (see Section 6.8).

6.6.2 Setting Up the Graphical Display

Almost all the steps in setting up a graphical display are performed in the Graphical Display Setup dialog box (as shown in Figure 6-15).

Figure 6-15



The Graphical Display Setup Dialog Box

Table 6-3 describes each choice in the Graphical Display Setup dialog box.

Table 6-3
Graphical Display Setup Choices

Use:	To:
Port	Identify the port to which the statistics in the graphical display will apply (A or B). If you are performing a Statistics Task using dual ports (e.g., X.25/LAPB on Port A and Frame Relay on Port B), you can set up a graphical display for both link protocols, or, if desired, display one set of statistics in a table and the other graphically. **IMPORTANT:** In dual port testing, the maximum of two statistics rule means two total statistics can be selected for both ports; you cannot select two statistics per port (for a total of four). If you are performing a Statistics Task using a single port, the port you are not configuring is not available (i.e., grayed out) as a choice.
Available	View the list of the statistics you can include in the graphical display. Remember the statistics that are available to you are based on the link protocol you selected in the WAN Port Configuration dialog box (see Section 6.2.2).
Selected	View the statistics you have chosen to include in the graphical display. Note that this box is empty when you have entered the Statistics Task for the first time in a WAN Analyzer session (unless you have recalled a set of selected statistics from a configuration file).
Add	Choose a maximum of two statistics for inclusion in the graphical display, as follows: 1. In the **Available** box, click on the statistic(s) you want to include in the graphical display. **RESULT:** The statistic(s) you have clicked on is highlighted. For example, Figure 6-16 shows what the **Available** box would look like if you selected Valid frames and Invalid frames to be displayed graphically.

Table 6-3
Graphical Display Setup Choices (Continued)

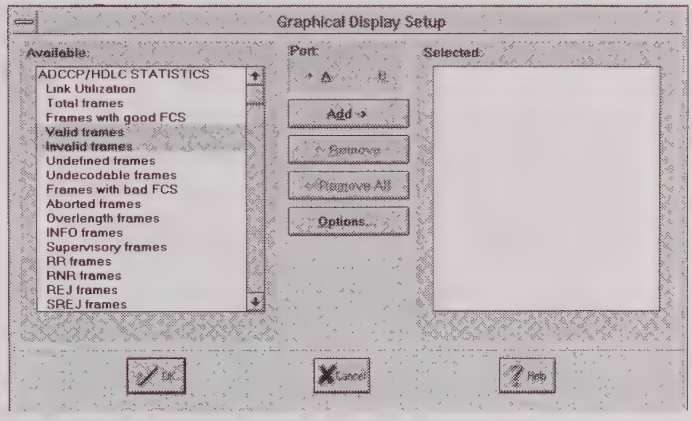
Use:	To:
	 **Figure 6-16** **Choosing the Statistics For the Graphical Display** 2. Click on the **Add** button. **RESULT:** The statistics you highlighted are moved (i.e., added) to the **Selected** box, and will be included in the graphical display. Note that the **Add** button is not available (i.e., grayed out) until you have highlighted a statistic in the **Available** box. Also note that, in lieu of using the **Add** button, you can double-click on the individual statistic of the choice to send it to the **Selected** box.
Remove	Remove one or both of the currently selected statistics from the graphical display, as follows: 1. In the **Remove** box, click on the statistic(s) you want to remove from the graphical display. **RESULT:** The statistic(s) you have clicked on is highlighted. For example, Figure 6-17 shows what the **Selected** box would look like if you chose Valid frames for removal.

Table 6-3
Graphical Display Setup Choices (Continued)

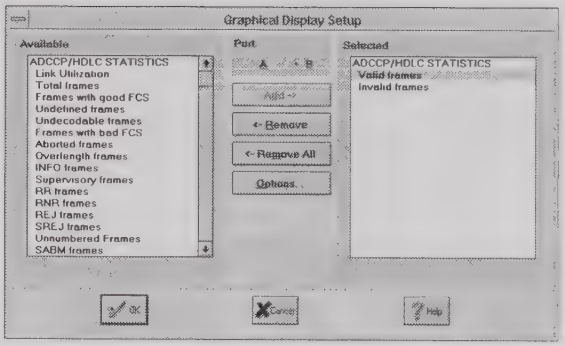
Use:	To:
	 **Figure 6-17** **Removing a Statistic(s) From the Graphical Display** 2. Click on the **Remove** button. **RESULT:** The statistic(s) you highlighted has been removed from the **Selected** box, and returned to the **Available** box. Note that the **Remove** button is not available (i.e., grayed out) until you have highlighted a statistic in the **Selected** box. Also note that, in lieu of using the **Remove** button, you can double-click on either of the statistics to return it to the **Available** box.
Remove All	Delete both statistics from the **Selected** box, and return them to the **Available** box, as follows: 1. Click on the **Remove All** button. **RESULT:** The statistics in the **Selected** box are moved (i.e., deleted) from the **Selected** box, and are returned to the Available box; as a result, the **Selected** box is empty. Note that you can also remove all by double-clicking on the link protocol banner (e.g., ADCCP/HDLC Statistics) in the **Selected** box.

Table 6-3
Graphical Display Setup Choices (Continued)

Use:	To:
Options	Customize the format of the graphical display. To get started, click on the **Options** button to access the Graphical Display Options dialog box (as shown in Figure 6-18).

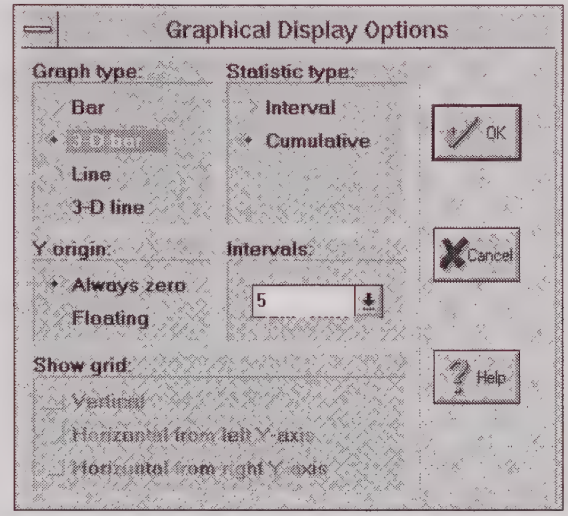


Figure 6-18
The Graphical Display Options Dialog Box

The choices available to you in the Tabular Display Options dialog box are:

1. **Graph type** enables you to select a graph style.

   a. **Bar** enables you to display the statistics in a flat bar graph (as shown in Figure 6-19).

Table 6-3
Graphical Display Setup Choices (Continued)

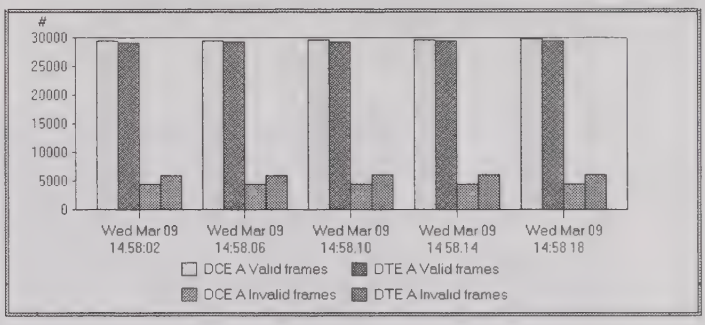
Use:	To:
	

Figure 6-19
Flat Bar Graph

b. **3-D bar** enables you to display the statistics in a three-dimensional bar graph (as shown in Figure 6-20).

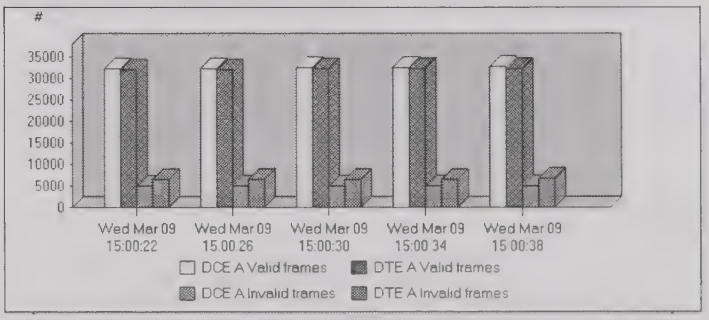


Figure 6-20
3-D Bar Graph

c. **Line** enables you to display the statistics in a flat line graph (as shown in Figure 6-21).

Table 6-3
Graphical Display Setup Choices (Continued)

Use:	To:

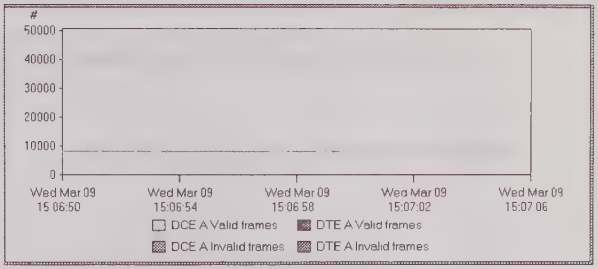


Figure 6-21
Flat Line Graph

d. **3-D line** enables you to display the statistics in a three-dimensional line graph (as shown in Figure 6-22).

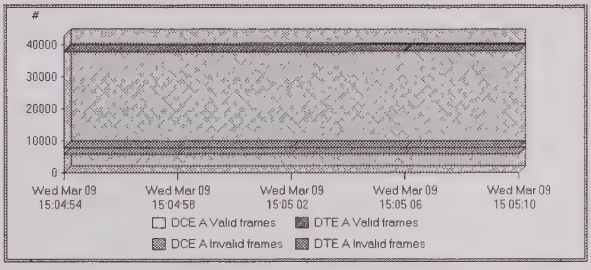


Figure 6-22
3-D Line Graph

2. **Statistic type** enables you to determine the way in which the statistics are updated.

   a. **Interval** enables the statistical results to only reflect a single interval — the one you specified in the Source Options dialog box (see Section 6.4). In other words, the result total does not accumulate with each succeeding interval.

Table 6-3
Graphical Display Setup Choices (Continued)

Use:	To:
	b. **Cumulative** adds the statistical results of the latest interval to all previous totals. In other words, the result total does accumulate with each succeeding interval. 3. **Y origin** determines the value of the Y origin. a. **Floating** indicates the value of the Y origin is based on the least data value. b. **Always zero** indicates the value of the Y origin is zero, regardless of the data value. 4. **Intervals** determines the number of intervals you want to display, to a maximum of ten. Click on the arrow to open the box, then click on the appropriate number. When you reach the number of intervals you wanted to display on the graph, the first interval is deleted from the left side to make room for the last interval on the right side. 5. **Show grid** enables you to specify the horizontal and vertical lines you want to use in the line graph. Note that you may select any combination (or none) of the following by placing a check in the appropriate box: a. **Vertical** inserts a vertical dividing line in the middle of the line graph. Even when selected, this choice has no affect on bar graphs. This choice is not available (i.e., grayed out) when you select **3-D bar** or **3-D line** as the graph type. b. **Horizontal from left Y-axis** inserts a horizontal line across the flat line or flat bar graph. This line originates from the left Y axis. This choice is not available (i.e., grayed out) when you select **3-D bar** or **3-D line** as the graph type. c. **Horizontal from right Y-axis** inserts a horizontal line across the graph. This line originates from the right Y axis, and should be used only when you are working with two different measurement units (e.g., percent and total number); in such instances, a vertical axis appears on each side of the graph. This choice is not available (i.e., grayed out) when you select **3-D bar** or **3-D line** as the graph type.

After Setting Up The Graphical Display...

Assume, for example, you've selected link utilization and invalid frames as the ADCCP/HDLC statistics you want to display graphically for Port A. When doing so, the Graphical Display Setup dialog box looks like the one shown in Figure 6-23.

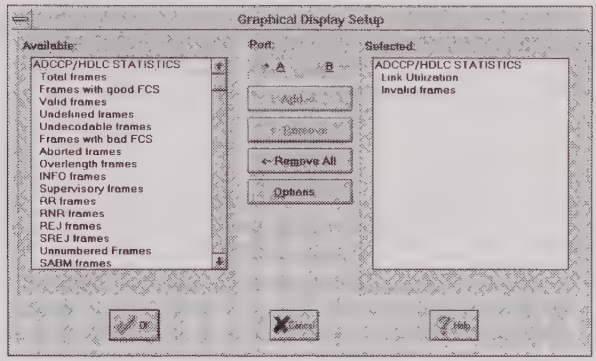


Figure 6-23
Sample Graphical Display Setup Dialog Box

Also assume you have already entered the Graphical Display Options dialog box, and chosen a **Bar** graph-type, a **Cumulative** statistic-type, a Y origin of **Always zero**, **7** graphic intervals, and **Horizontal** lines **from** the **left Y-axis**, as shown in Figure 6-24.

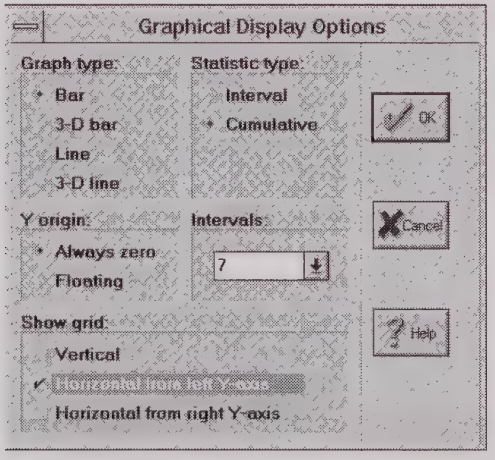


Figure 6-24
Sample Graphical Display Options Dialog Box

After you have set up all the parameters of the graphical display as shown in Figures 6-23 and 6-24, and after pointing and clicking on **OK** in the Graphical Display Setup dialog box, you will see that the graphical display on the **Statistics** screen looks like the one shown in Figure 6-25:

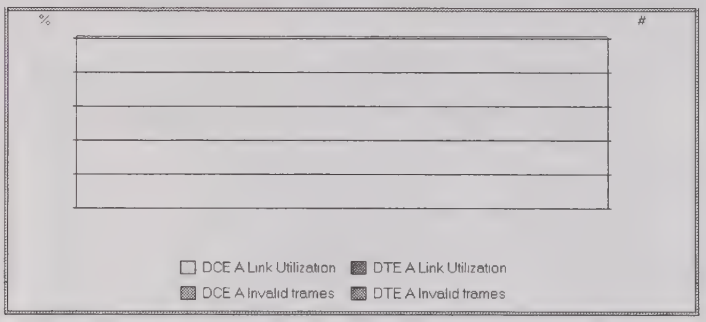


Figure 6-25
The Resulting Graphical Display (Before Statistics are Enabled)

Since you haven't enabled the gathering of statistics at this point, the display is blank. However, the squares to the left of each label at the bottom of the display show the colors that will be used to graph the statistics; the labels indicate the source and port from which statistics will be gathered, as well as the names of the statistics you specified in the Graphical Display Setup dialog box.

Once you have enabled the gathering of statistics, the graphical display will look like the one shown in Figure 6-26 (after seven intervals):

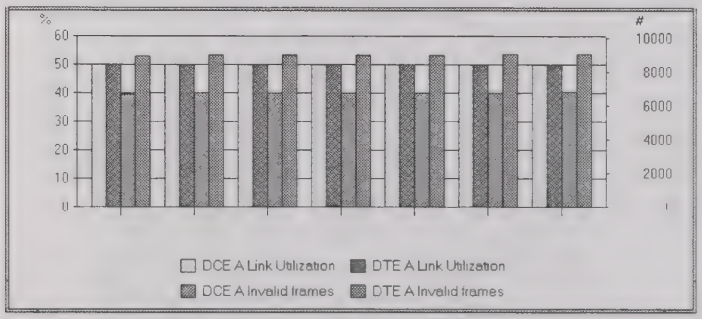


Figure 6-26
The Resulting Graphical Display (After Statistics are Enabled)

6.6.3 Choosing Colors for The Graphical Display

The WAN Analyzer gives you the ability to choose the four colors that represent the statistics in the graphical display, as follows:

1. From the **Statistics** screen, click on **Setup**.
2. Select **Graph colors** from the open menu.

   RESULT: The Graph Colors dialog box appears on the display (see Figure 6-27). This dialog box shows the four current color choices.

   Although it is not required for choosing colors, it is recommended you have already set up the graphical display, and the four color squares that represent the current choices (at the bottom of the display) are visible along with the Graph Colors dialog box.

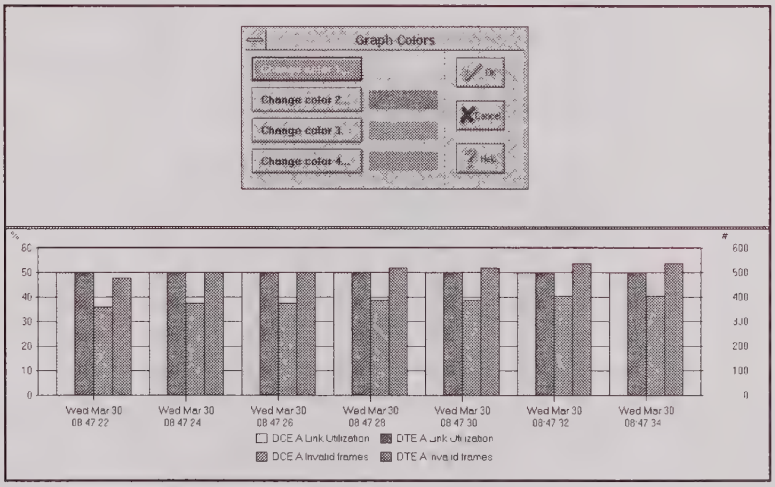


Figure 6-27
The Graph Colors Dialog Box

3. Select the color you want to change, then click on **OK**.

RESULT: The Color dialog box appears on the display (as shown in Figure 6-28).

NOTE: The selection of certain colors (those dithered) may not appear in the display. If this occurs, please choose another (non-dithered) color.

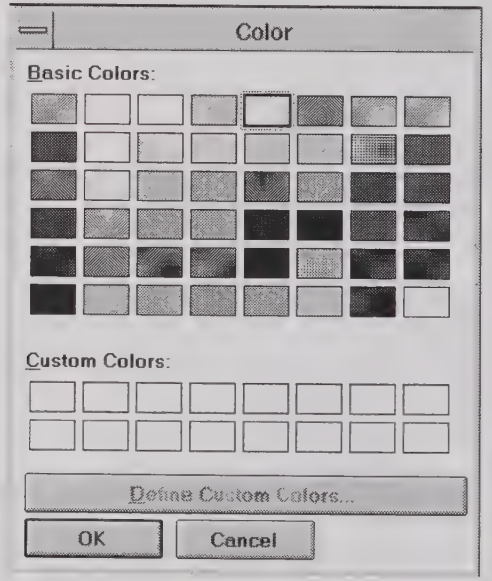


Figure 6-28
The Color Dialog Box

3. Select the color of the choice, then click on **OK** to put the selection into effect, or click on **Cancel** to leave the previous settings intact and return to the Graph Colors dialog box.

4. Repeat steps 2 and 3 if you want to change any of the three remaining color selections.

5. When you have changed all colors as desired, click on **OK** in the Graph Colors dialog box.

RESULT: The squares at the bottom of the tabular display should reflect the new color choices.

6.7 LOGGING STATISTICS TO A FILE

If desired, you have the ability to log the entire set of the link protocol statistics you're currently working with to a file. When you choose the logging option, please note these important facts:

- The logging activity sends all of the current link protocol statistics to a file, not just the ones you're currently using in displays.
- The logging activity works independently of the tabular and graphic displays, and has its own interval and time settings. Thus, when you enable logging, you can also enable the collection of statistics, even when the tabular and the graphical displays are empty.

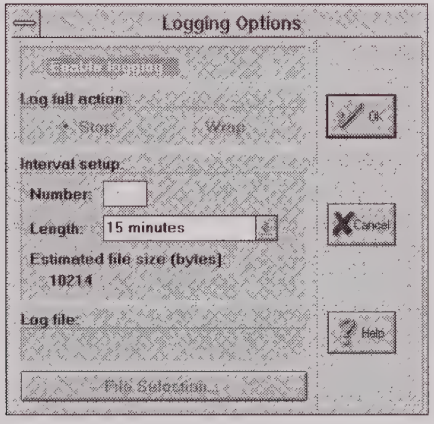
6.7.1 The Logging Options Dialog Box

You can set up the logging options using the Logging Options dialog box, which you can access by doing the following:

1. Click on **Setup** in the WAN Analyzer Main Menu.
2. Select **Logging** from the open menu.

RESULT: The Logging Options dialog box appears on the display (as shown in Figure 6-29).

Figure 6-29



The Logging Options Dialog Box

Note that Logging is not available (i.e., grayed out) when the collection of statistics is in progress (see Section 6.8).

Table 6-4 describes each choice in the Logging Options dialog box.

Table 6-4
Logging Options Choices

Use:	To:
Enable logging	Enable logging immediately upon enabling the collection of statistics. (A check mark in the box indicates logging is enabled.) Note that the other choices in this dialog box are available only when **Enable logging** is checked.
Log full action	Choose the action you want to take once you have reached the specified number of intervals. **Stop** indicates logging stops; Wrap indicates that logging wraps around to the beginning of the file. When Wrap is selected, the first intervals are overwritten, making room for the latest intervals.
Interval setup	Set the number and length of the intervals you want to use. 1. **Number** can be any number of statistical intervals from 1 to 999. 2. **Length** enables you to select the length of time between intervals. Click on the arrow to open the box that contains the time intervals that are available to you, which range from 1 second to 24 hours. To actually choose a time interval, simply click on the desired selection. 3. Estimated file size (bytes) indicates the size of the log file based on the number of intervals you specified. Note that this part of the box is for display only.
Log file	View the name of the log file that will be used as the statistics log. Note that this box is for display only.
File selection	Enter the Select Output Log File dialog box, where you can specify the name and location of the file that will be used as the statistics log.
OK	Exit and save the values you set in the dialog box, and return to the Statistics screen.
Cancel	Exit and cancel the values you set in the dialog box, and return to the Statistics screen.

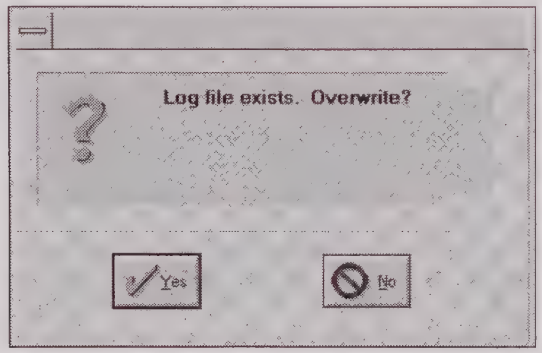
6.7.2 Enabling Logging

After you have set the Logging Options dialog box as required, you can enable logging by:

1. Pointing and clicking on the **Actions** menu.
2. Selecting **Enable Collection** or **Trigger Collection**, as desired (see Section 6.8).

   RESULT: The message in Figure 6-30 appears on the display.

Figure 6-30
Log File Message



3. Click on **Yes** to enable logging; click on **No** to cancel logging.

6.8 COLLECTING STATISTICS

Once you have set up the parameters of the Statistics Task (e.g., display type, individual statistics, etc.), you should be ready to begin collecting statistics. Using the **Setup** menu, you can choose to do any of the following:

- Immediately start the collection of statistics.
- Start the collection of statistics upon receipt of the trigger event specified in the Capture Task (see Section 4).
- Freeze the display of statistics while a Task continues.
- Restart the accumulation of statistics from zero on one or more ports.
- Stop the collection of statistics.

- Step forward through a log file.
- Obtain a hard copy of the tabular or graphic display.

The sections immediately following describe each activity in detail.

6.8.1 Starting the Collection of Statistics Immediately

To start the collection of statistics immediately, do the following:

1. Click on the **Actions** menu.
2. Select **Enable Collection** from the open menu.

   RESULT: The title bar of the Statistics screen reflects that the port is enabled.
3. Click on the **Task** menu.
4. Select **Start** from the open menu.

   RESULT: The displays and/or log file accepts statistics at the time interval you specified.

If you want to delay the collection of statistics until after you have started the WAN Analyzer, perform steps 3 and 4 prior performing to steps 1 and 2.

6.8.2 Starting the Collection of Statistics on a Trigger

To start the collection of statistics upon receipt of the trigger event specified in the Capture Task, do the following:

1. Click on the **Actions** menu.
2. Select **Trigger Collection** from the open menu.

   RESULT: The title bar of the Statistics screen reflects that the port is enabled.
3. Click on the **Task** menu.

4. Select **Start** from the open menu.

   RESULT: The displays and/or log file begins collecting statistics when the event you specified as a trigger (e.g., contents match, bad FCS, etc.) occurs. See Section 4 for a complete description of the **Capture** Task.

6.8.3 Freezing the Graphical and Tabular Displays

To freeze the display of statistics in the table or graph while the Task is in progress, and continue to collect statistics, do the following:

1. Click on the **Actions** menu.
2. Select **Freeze** from the open menu.

   RESULT: The statistical data that currently appears in the display is frozen (i.e., will not be updated) even though the test is still in progress. Additionally, the title bar of the Statistics screen reflects the port is frozen.

To "unfreeze" the display and show the most current statistical data, do the following:

1. Click on the **Actions** menu.
2. Select **UnFreeze** from the open menu.

   RESULT: The statistical data that currently appears in the display is updated to reflect its current total/value.

6.8.4 Resetting Statistics to Zero Totals/Values

To reset the statistical totals to zero while a test is in progress, do the following:

1. Click on the **Actions** menu.
2. Select **Reset** from the open menu.

   RESULT: The Reset Statistics dialog box appears on the display (as shown in Figure 6-31).

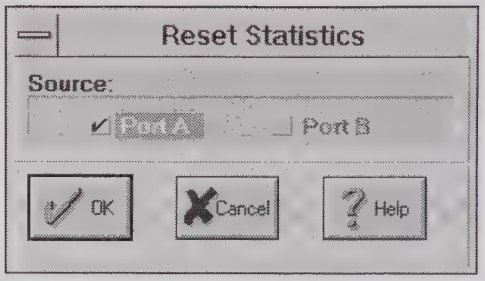


Figure 6-31
The Reset Statistics Dialog Box

3. Place a check in the box next to the port for which you want to statistics to be reset (A, B, or both), then click on **OK**. If you are only using a single port, the port you are *not* working with is not available (i.e., grayed out).

   RESULT: All statistical totals/values in the displays and log file are reset to zero.

6.8.5 Stopping the Collection of Statistics

To stop the collection of statistics:

1. Click on the **Actions** menu.
2. Select **Disable Collection** from the open menu.

   RESULT: The displays and/or log file should immediately stop collecting statistics. Additionally, the title bar of the Statistics screen reflects that the port is disabled.

3. If you also want to stop the Task, click on the **Task** menu.
4. Select **Stop** from the open menu.

6.8.6 Stepping Forward Through a Log File

When the source of the statistics is a log file, you have the ability to step forward through the log file and update the display, as follows:

1. Click on the **Actions** menu.

2. Select **Step** from the open menu.

6.8.7 Obtaining a Hard Copy of the Tabular and/or Graphical Display

To obtain a hard copy of the tabular or graphical display (even while the Task is in progress), do the following:

1. Click on the **Actions** menu.
2. Select **Print** from the open menu.

   RESULT: The Print Statistics dialog box appears on the display (as shown in Figure 6-32).

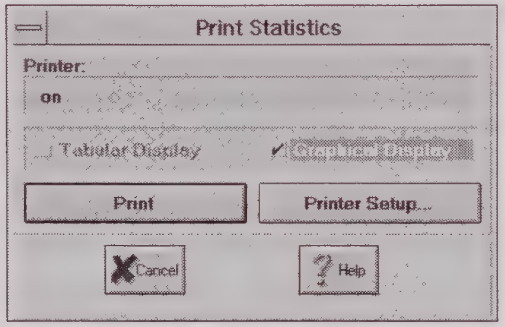


Figure 6-32
The Print Statistics Dialog Box

3. Place a check in the box next to the display you want to print (tabular, graphical, or both).
4. Click on the **Print** button.

   RESULT: A hard copy of the displays you selected is sent to the print to which you are connected.

   NOTE: This four-step procedure assumes you have established a connection to a printer. If you cannot complete this procedure successfully, see Section 3.7 of this manual.

6.9 STATISTICS-SPECIFIC ICONS

The toolbar icon offers seven icons that are specific to the Statistics Task, as follows:

Icon:	Description:
	Enables you to start the collection of statistics immediately. This icon is identical in function to selecting **Enable Collection** from the **Actions** menu.
	Enables you to start the collection of statistics upon receipt of the trigger specified in the Capture Task. This icon is identical in function to selecting **Trigger** from the **Actions** menu.
	Enables you to edit the current filter set (i.e., frame or lead). This icon is identical in function to selecting **Edit filters** from the **Actions** menu.
	Enables you to stop the collection of statistics. This icon is identical in function to selecting **Disable Statistics** from the **Actions** menu.
	Enables you to step through the log file. This icon is identical in function to selecting **Step** from the **Actions** menu.
	Enables you to obtain a hard copy of the tabular and/or graphic display. This icon is identical in function to selecting **Print** from the **Actions** menu.

SECTION 7
THE TRAFFIC GENERATION TASK

7.1 SECTION SUMMARY

This section of the manual gives you detailed information about the WAN Analyzer Traffic Generation Task. It describes of the following:

- Why you generate traffic.
- How to build the frame(s) to be used as traffic.
- How to use these frames to simulate data traffic.

7.2 AN OVERVIEW OF TRAFFIC GENERATION

Traffic generation is a Task that enables you to create a frame or series of frames that imitate live traffic in a variety of applications (e.g., a lab). The primary advantage of this option is that it enables you to test how equipment and applications respond to high volumes of traffic in an out-of-service environment.

NOTE: The Traffic Generation Task is available for all FIREBERD 300/500 link protocols.

7.2.1 What You Can Do in the Traffic Generation Task

The general activities that you can perform in the Traffic Generation Task are presented in the order in which you would normally perform them, as follows:

1. Build the frame(s) that serves as the traffic to be generated during a test.
2. If you are transmitting continuously, set a transmit interval (i.e., time delay between frame transmission).
3. Transmit a frame-type a single time or transmit a frame-type continuously.

While generating traffic, you can read the decoded frames that were generated by the receiving device in the Display Task (described in Section 5). For example, if the frame-type being built is a SABM, and that frame is continuously generated to the device being tested, use the Display Task to see if a UA is being received in response to every SABM transmitted.

Use the Statistics Task (described in Section 6) to study the data gathered during traffic generation. For example, the Statistics Task can tell you how many times the frame was generated and how many errors were recorded.

7.2.2 Traffic Generation vs Emulation

Although traffic generation and emulation are somewhat similar, these Tasks actually serve two very different applications.

- Traffic generation enables you to simulate traffic by transmitting a single frame over and over again. Traffic generation is ideal for stress-testing the equipment's tolerance to high volumes of information. However, because it is limited to sending a single frame-type at any given time, the Traffic Generation Task should not be used to simulate protocol handshaking sequences.

- Since emulation is protocol-sensitive, it is ideal for determining how equipment responds to various handshaking scenarios (e.g., call set-ups, readiness to receive data, etc.). As such, you can carry out extended dialogs, and test how the equipment will actually react to specific situations in the field.

7.3 T1/DATA ACCESS REQUIREMENTS FOR TRAFFIC GENERATION

The Traffic Generation Task is only available with specific T1/Data access types. Before starting traffic generation, make sure the current T1/Data access type is one of those shown in Table 7-1.

Table 7-1
T1/Data Access Requirements for Traffic Generation

If The Test Type Is:	Then The Access Type Must Be:	And The Recommended Generator Clock Is:
Data WAN Protocol	Emulate DTE or Emulate DCE	Internal (Synthesizer)
T1 WAN Protocol	Originate or Drop and Insert	Internal (Synthesizer)
T1 ISDN PRI WAN Protocol Fixed)	Originate	Internal (1.544 MHz

NOTE: After starting traffic generation, check the Display Task to verify that you are sending and receiving traffic. If you are not, check the current clock source; if you have selected anything other than **Internal**, change the setting.

7.4 ENTERING THE TRAFFIC GENERATION TASK

To enter the traffic generation Task:

1. Click on **Task**.
2. Select **Traffic Generation** from the open menu.

   RESULT: The **Port A** and **Port B** extension appears to the right of the **Traffic Generation** selection.

3. Choose the port on which you want to perform traffic generation (i.e., **A** or **B**).

   RESULT: The Traffic Generator dialog box appears on the display. Note that the title bar also reflects the port that you have selected (**A** or **B**).

   Note that if you are conducting a single port test, the port that you're *not* working in is not available (i.e., "grayed out").

When the Traffic Generator dialog box appears, you have entered the Traffic Generation Task. This dialog box lets you:

- Transmit a single frame once.
- Start transmitting a single frame continuously.
- Stop transmitting a single frame continuously.

However, before using this dialog box, you must:

1. Build the frame(s) that will serve as generated traffic.
2. Recall a previously built frame that has been stored in a configuration file.

Section 7.5 describes the traffic generation frame builder; Section 3.6.4 describes how to recall a previously saved configuration; Section 7.7 describes the Traffic Generator dialog box.

7.4.1 If The Traffic Generation Task Cannot Be Selected ...

If **Traffic Generation** cannot be selected (i.e., if it is grayed out) from the **Task** menu, it is most likely due to the following:

1. The current T1/Data access type (e.g., monitor or receive only) does not support traffic generation.

   a. Click on **Test Manager!** in the WAN Analyzer Main Menu.

      RESULT: **The FIREBERD Test Manager** appears on the display.

   b. Click on the **T1/Data** icon.

      RESULT: **The current top-le**vel configuration (T1 Configuration or Data Configuration) dialog box appears on the display.

   c. See Section 7.3 for a description of the T1/Data access types that support traffic generation, and change the current access type as required.

2. The Traffic Generation Task may already be open. You can verify this by arranging the open Tasks by title, as follows:

   a. Click on the **Window** menu selection.

      RESULT: The **Window** menu choices are displayed on the screen.

   b. Click on **Cascade**.

3. If you working with Frame Relay or ISDN Primary Rate, the Emulation Task may be open; the Traffic Generation and Emulation Tasks cannot be open at the same time.

   a. Click on the **Frame Relay Port** or the **ISDN Port** screen Control Box (the bar in the upper left corner of the **Frame Relay Port** or **ISDN Port** title bar).

   b. Select **Close** from the open menu.

7.5 BUILDING FRAMES FOR TRAFFIC GENERATION

Frame building is a required activity in the Traffic Generation Task. Simply put, the frame(s) that you build serve as the traffic that you generate to the device you want to test. All frame-building activity takes place in the Frame Builder dialog box, described in the section immediately following.

7.5.1 Entering the Frame Builder Dialog Box

To enter the Frame Builder dialog box, do the following:

1. Click on **Setup**.
2. Select Frame Builder from the open menu.

RESULT: The Frame Builder dialog box (see Figure 7-1) appears on the display. Note that the title of the dialog box reflects the port on which you want to generate traffic (A or B). Additionally, the name of the link protocol that appears in the title bar is identical to the link protocol specified in the WAN Port Configuration dialog box.

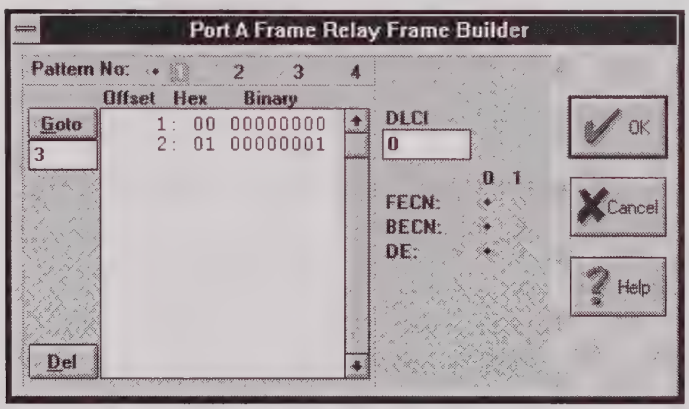


Figure 7-1
Sample Frame Builder Dialog Box

7.5.2 Basic Rules For Building Frames

The basic rules for frame building are as follows:

1. You can build as many as four different frames in a single Frame Builder dialog box.
2. Each bit pattern within a frame consists of one or more individual octets (i.e., bytes). You may have a minimum of 2 to 4 overhead octets and a maximum of 16,384 octets in a single frame. Note that overhead octets cannot be deleted.
3. All frames must be built from nothing. Depending on the link protocol that you are working with, as many as the first four offsets may be reserved for overhead (e.g., address, frame-type, etc.); the remaining offsets are reserved for data.

4. Like the Contents match dialog box, the frame builder features frame and bit helpers for offsets reserved for overhead information such as address and frame type, as well as the bit positions within the offsets, respectively. Section 4.6.2 fully describes how frame and bit helpers work.

   NOTE: If you are working with the ADCCP/HDLC link protocol, and you have selected extended addressing in the WAN Port Configuration dialog box, frame and bit helpers are not available; all overhead information must be entered manually.

5. All bits in offsets reserved for data are set to zero (i.e., 00000000). You may change these bits to reflect any value that you desire.

7.5.3 The Components of the Frame Builder Dialog Box

As shown in the sample dialog box in Figure 7-1, the Frame Builder dialog box has a number of individual components. Each component is described in Table 7-2.

Table 7-2
The Components of the Frame Builder Dialog Box

The Component:	Lets You Do the Following:
Pattern No.	Enter the number of the frame that you are creating. Click to place a dot in the appropriate diamond (1-4).
Pattern Editor	Create or edit any octet in a frame. The individual parts of the editing box are described from right to left, as follows: **Binary** enables you to manually create the individual values in the octet in the binary format. Use zeros and ones to fill in each bit position in the octet, as desired. Note that ones and zeros are the only values that are accepted in this field; place the cursor to the left of the bit position you want to work in, then use the keyboard to enter the appropriate character. Also note that as you change the bits in the octet, the **Hex** value automatically change to reflect its current hexadecimal value. **Hex** specifies the actual hexadecimal value of the current octet. To manually change this value, use the mouse to place the cursor to the left of the current value, then use the keyboard to enter the appropriate characters. Also note that as you change the value, the octet automatically reflects the new value as well.

Table 7-2
The Components of the Frame Builder Dialog Box (Continued)

The Component:	Lets You Do the Following:
	Offset is the sequence number assigned to any octet in a frame. Note that, based on the link protocol you're working in, certain offsets are often reserved for specific information. For example, in X.25/LAPB, Offset 1 is always reserved for the address, and Offset 2 is reserved for the frame type.
Goto	Select a specific offset number. To edit an existing offset, simply enter the appropriate number in the box provided, then press the **Enter** key. If the offset number that you enter doesn't exist, then it will be created for you and placed in numerical sequence within the frame.
Del	Delete any offset in the bit pattern (except overhead bits). To do this, simply place the cursor anywhere in the offset by pointing and clicking, then press the **Del** button.
Frame and Bit Helpers	Get help in matching key frame- and bit-types to specific offsets and bit positions within the offsets, respectively. Note that the frame and bit helpers that are available to you will vary based on the link protocol in which you are working. Section 4.6.2 fully describes frame and bit helpers.
OK	Save the Frame Builder dialog box and return to the Traffic Generator dialog box.
Cancel	Cancel the latest entries in the Frame Builder dialog box and return to the Filter Setup dialog box.

7.6 SETTING A TRANSMIT INTERVAL

When transmitting a single frame-type continuously, you must set an approximate delay time for transmission between frames. This delay time is called a transmit interval.

For example, if you're transmitting a frame-type (e.g., a SABM) continuously, and you've specified a transmit interval of five milliseconds, the WAN Analyzer will wait five milliseconds from the transmission of a SABM before sending the next one in sequence.

The transmit interval is set using the Set Transmit Interval dialog box. To gain access to this dialog box, do the following:

1. Click on **Setup**.
2. Select **Txmit Interval** from the open menu.

RESULT: The Set Transmit Interval dialog box (see Figure 7-2) appears on the display. Note that the title of the dialog box reflects the port for which you are setting filters (A or B).

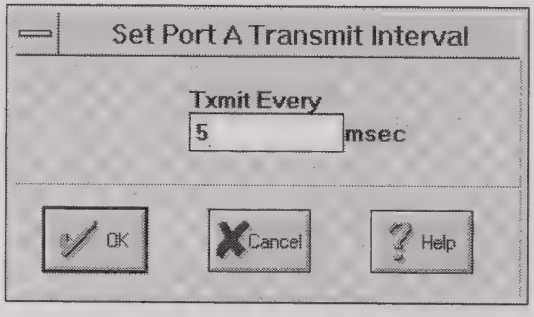


Figure 7-2
The Set Transmit Interval Dialog Box

Once the dialog box appears on the display, you can enter the transmit interval that you desire in the box provided. The valid range is 0-9995 milliseconds.

NOTE: Any transmit interval value that you enter is always rounded off to the next highest increment of 5 milliseconds. For example, if you enter a transmit interval value of 6, the actual transmit interval rate will be 10.

If you enter a transmit interval of 0 milliseconds, and you're sending a frame with a small number of bytes (40-50), you may be sending frames too quickly; in such instances, the WAN Analyzer will stop running rather than lose its ability to gather data.

7.7 GENERATING TRAFFIC

Once you have built the frame-type(s) that you want to use in the Traffic Generation Task, you are ready to begin generating traffic. This activity is controlled by the Traffic Generator dialog box (see Figure 7-3). Note that the title of the dialog box reflects the port on which you are generating traffic (A or B). Additionally, the name of the currently selected link protocol appears just below the title bar.

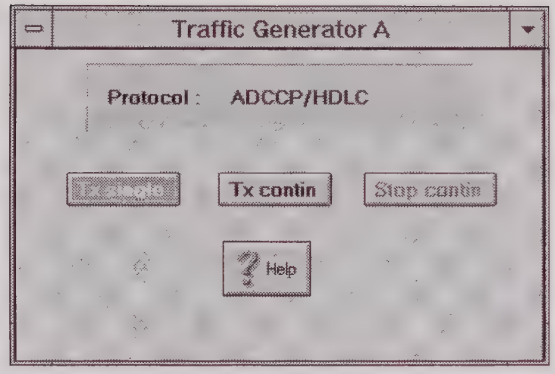


Figure 7-3
The Traffic Generator Dialog Box

The Traffic Generator dialog box appears on the display when you enter the Traffic Generation Task, and remains available as long as you're in the Task. However, it should be used only after you have built the frame you want to use, and set the transmit interval.

Table 7-3 describes the components of the Traffic Generator dialog box.

Table 7-3
The Components of the Traffic Generator Dialog Box

The Component:	Lets You Do the Following:
Tx single	Transmit a frame-type a single time.
Tx contin	Start the continuous transmission of a frame-type.
Stop contin	Stop the continuous transmission of a frame-type.

When you select either **Tx single** or **Tx contin**, and the WAN Analyzer is idle (i.e., not running), you will see the message shown in Figure 7-4:

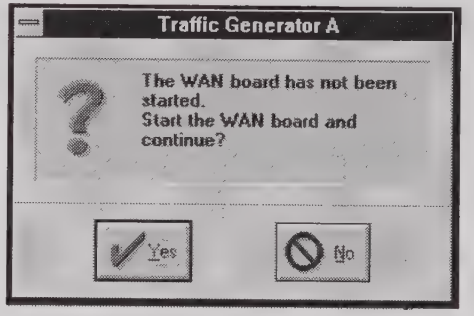


Figure 7-4
Traffic Generator Message

Choose **Yes** to start the WAN Analyzer and begin the Traffic Generation Task; choose **No** to leave the WAN Analyzer in an idle state.

7.8 GENERAL PROCEDURE FOR GENERATING TRAFFIC

Here is the general procedure for generating traffic with the WAN Analyzer. Note that these steps assume that you've already entered the Traffic Generation Task.

NOTE: Before setting up the Traffic Generation Task, enter the Statistics Task and select the data you want to study (e.g., link utilization, number of frames sent, etc.).

1. Click on **Setup**.

2. Select **Frame Builder** from the open menu.

   RESULT: The Frame Builder dialog box appears on the display.

3. Use the Frame Builder dialog box to build a frame (or frames).

   a. Open the **Frame type** box by pointing and clicking on the arrow below the label, then select the frame-type you want to create from the open menu.

   b. Use the frame and bit helpers to create the offsets for the overhead bits (see Section 4.6.2).

   c. Create as many data offsets as you want.

4. If you have built more than one frame, make sure you have clicked on the **Pattern No.** you want to use in the current Traffic Generation Task before you end the frame building session.

5. When you have completed the frame building activity, click on **OK** to save the work that you've done.

   RESULT: The Frame Builder dialog box closes and the Traffic Generator dialog box appears by itself on the display.

6. Click on Setup.

7. Select **Txmit Interval** from the open menu.

   RESULT: The Set Transmit Interval dialog box appears on the display.

8. Enter the transmit interval that is appropriate for the Traffic Generation Task. The allowable range is 0-9995.

9. When you have entered a transmit interval, click on **OK**.

   RESULT: The Set Transmit Interval dialog box closes and the Traffic Generator dialog box appears by itself on the display.

10. Begin traffic generation by selecting **Tx single** or **Tx contin** from the Set Transmit Interval dialog box.

7.9 TRAFFIC GENERATION HINTS

7.9.1 Tiling the Display or Statistics Task

While generating traffic, it is useful to tile the Display or Statistics Task so that you can view the results of the activities without switching screens. To do this, perform the following steps:

1. With the Traffic Generation Task open, also open the **Task** menu and select **Display** or **Statistics** (depending on the results you want to see).

2. Click on **Window**.

3. Click on **Tile** from the open menu.

   RESULT: The Traffic Generation and the Display (or Statistics) Tasks appear together on the display.

7.9.2 Saving The Current Traffic Generation Configuration to a File

If you're planning on using the frames that you have built more than once, it is highly recommended that you save the current traffic generation configuration to a file. Section 3.6 describes how you do this.

7.10 TRAFFIC GENERATION ICONS

The toolbar icon offers two icons that are specific to the Traffic Generation Task, as follows:

Icon:	Description:
	Enables you to enter the Frame Builder dialog box. This icon is identical in function to selecting **Frame Builder** from the **Setup** menu.
	Enables you to enter the Set Transmit Interval dialog box. This icon is identical in function to selecting **Txmit Interval** from the **Setup** menu.

SECTION 8
ISDN AND FRAME RELAY EMULATION

8.1 SECTION SUMMARY

This section of the manual gives you detailed information about the WAN Analyzer's ability to emulate ISDN Primary Rate and Frame Relay devices. It offers the following:

- An overview of the emulation activity.
- T1/Data and WAN Port Configuration access requirements.
- The procedures for emulating ISDN Primary Rate.
- The procedures for emulating Frame Relay.

8.2 AN OVERVIEW OF EMULATION

The WAN Analyzer Emulation Task gives you the ability to emulate the components of an ISDN Primary Rate and Frame Relay network by automatically controlling the ISDN Primary Rate and Frame Relay protocols. Specifically, it allows the WAN Analyzer to emulate the way an ISDN Primary Rate or Frame Relay component would normally operate within a network.

When used in installation testing, emulation is an ideal tool for evaluating the handshaking ability of new devices before they are placed in a live environment. Emulation is also an ideal troubleshooting tool, because it can isolate faulty equipment quickly, and keep out-of-service test time to a minimum.

8.2.1 Emulation vs Traffic Generation

Although emulation and traffic generation are somewhat similar, these Tasks actually serve two very different applications.

- Since emulation is protocol-sensitive, it is ideal for determining how equipment responds to various handshaking scenarios (e.g., call set-ups, readiness to receive data, etc.). As such, you can test how the equipment will actually react to specific situations in the field.
- Traffic generation enables you to simulate traffic by transmitting a single frame over and over again. As such, if you're engaged in capacity planning, traffic generation is ideal for stress-testing the equipment's tolerance to high volumes of information. However, because you're limited to sending a single frame-type at any given time, the Traffic Generation Task should not be used to simulate protocol handshaking sequences.

8.3 ACCESS REQUIREMENTS FOR EMULATION

8.3.1 T1/Data Access Requirements For Emulation

The Emulation Task is only available with specific T1/Data access types. Before starting emulation, make sure the current T1/Data access type is one of those shown in Table 8-1.

Table 8-1
T1/Data Access Requirements for Emulation

If The Test Type is:	Then The Access Type Must Be:	And The Recommended Generator Clock Is:
Data WAN Protocol	Emulate DTE or Emulate DCE	Internal (Synthesizer)
T1 WAN Protocol	Originate or Drop and Insert	Internal (Synthesizer)
T1 ISDN PRI WAN Protocol	Originate	Internal (1.544 MHz Fixed)

Additionally, if you want to emulate ISDN, the test type must be T1 ISDN PRI WAN Protocol; if you want to emulate Frame Relay, the test type must be Data WAN Protocol or T1 WAN Protocol.

NOTE: After starting emulation, check the Display Task to verify that you are sending and receiving traffic. If you are not, check the current clock source; if you have selected anything other than Internal, change the setting.

8.3.2 WAN Port Configuration Requirements For Emulation

The Emulation Task is only available with the ISDN and Frame Relay link protocols. Thus, when you're setting up the WAN Port Configuration dialog box (see Figure 8-1), make sure that the link protocol selections are as described in Table 8-2. Additionally, if you want to emulate ISDN, make sure that you have selected Modulo 128 (in lieu of Modulo 8).

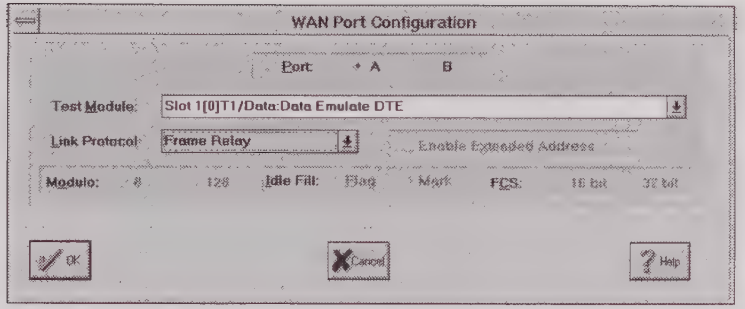


Figure 8-1
The WAN Port Configuration Dialog Box

Table 8-2
WAN Port Configuration Requirements for Emulation

If You Want to Emulate:	Link Protocol Selection Must Be:
ISDN Primary Rate	ISDN/LAPD
Frame Relay	Frame Relay

8.4 ENTERING THE EMULATION TASK

To enter the emulation Task:

1. Click on `Task`.
2. Select `Emulation`from the open menu.

   RESULT: The Port A and Port B extensions appears to the right of the Emulation selection.

3. Choose the port on which you want to perform emulation (i.e., A or B).

   RESULT: The ISDN or Frame Relay screen appears on the display, based on the Link Protocol Selection you selected in the WAN Port Configuration dialog box. The title bar of both screens reflect the port that you have selected (A or B).

   Note that if you are conducting a single port WAN test, the port that you're *not* working in is not available (i.e., "grayed out").

8.4.1 If The Emulation Task Cannot Be Selected ...

If the Emulation Task cannot be selected (i.e., if it is grayed out) from the Task menu, it is most likely due to the following:

1. The current T1/Data access type (e.g., receive only for T1, monitor for data, etc.) does not support emulation.

   a. Click on `Test Manager` in the WAN Analyzer Main Menu.

      RESULT: The FIREBERD 300/500 Test Manager appears on the display.

   b. Click on the T1/Data icon.

      RESULT: The current top-level configuration (T1 Configuration or Data Configuration) dialog box appears on the display.

   c. See Section 8.3.1 for a description of the T1/Data access types that support emulation, and change the current access type as required.

2. You haven't selected ISDN/LAPD or Frame Relay as the link protocol.

   a. Click on `Task` in the WAN Analyzer Main Menu.

   b. Select `Setup` from the open menu.

      RESULT: The Capture Mode and Ports extensions appears to the right of the Setup selection.

   c. Click on `Ports`.

      RESULT: The WAN Port Configuration dialog box appears on the display.

   d. Change the link protocol selection to `ISDN/LAPD` or `Frame Relay`, as desired, and then click on `OK`.

3. The Emulation Task may already be open. You can verify this by arranging the open Tasks by title, as follows:

   a. Click on the `Window` menu selection.

      RESULT: The Window menu choices are displayed on the screen.

   b. Click on `Cascade`.

4. Traffic Generation may be an open Task; the Traffic Generation and Emulation Tasks cannot be open at the same time.

   a. Click on the Traffic Generation's Traffic Generator Control Box (the bar in the upper left corner of the Traffic Generator title bar).

   b. Select `Close`from the open menu.

8.5 ISDN EMULATION

8.5.1 What You Can Do in the ISDN Emulation Task

The ISDN Emulation Task enables you to do all of the following:

1. Configure the WAN Analyzer for ISDN Primary Rate emulation.
2. Initiate or accept a call.
3. Initiate an auto-call (i.e., send a call using the called and calling numbers that you entered in the configuration dialog box , as described in Section 8.5.3).
4. Terminate (i.e., hang up) a call.
5. Restart a channel.
6. Send an in-service, maintenance, or out-of-service message.
7. Send a TEI audit.

8.5.2 When Entering the ISDN Emulation Task

When you initially enter the ISDN Emulation Task (as described in Section 8.4), the ISDN screen (as shown in Figure 8-2) appears on the display.

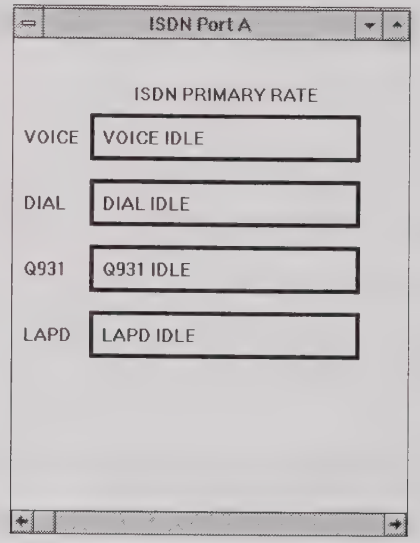


Figure 8-2
The ISDN Screen

At the beginning of the Emulation Task, the status boxes show that each activity is idle (i.e., not in use, but ready). However, the information in each box is updated as status changes occur during the Emulation Task. Table 8-3 lists the status information that can appear in each box.

Table 8-3
ISDN Primary Rate Status Information

The Box:	Shows:	Displays the Following Status:
VOICE	The current state of a call.	Idle Dialing Ringback Ringing Connected Idle Wait
DIAL	The number you are calling, with no parentheses or dashes.	Idle
Q931	The current state of the network layer.	Null Call Init Overlap Sending Out Call Proceeding Call Delivered Call Present Call Received Connect Request In Call Proceeding Active Disc Request Suspend Request Resume Request Release Request Overlap Receive Idle Establish Wait
LAPD	The current state of the link layer.	TEI Assigned Awaiting Release Multiframe Establish Timer Recovery Idle

Before starting the Emulation Task and viewing the changes in status, however, you must first configure the WAN Analyzer for ISDN Primary Rate emulation. This activity is performed using the ISDN Primary Rate dialog box, which is described in detail in the section immediately following.

8.5.3 Configuring the WAN Analyzer for ISDN Emulation

Before starting the Emulation Task, you must configure the WAN Analyzer for ISDN Primary Rate emulation, based on the specifics of the application. You can specify all of the configuration requirements in the ISDN Primary Rate dialog box.

To display the ISDN Primary Rate dialog box, do the following:

1. Click on `Setup`.
2. Select `ISDN` from the open menu.

   RESULT: The ISDN Primary Rate dialog box appears on the screen (as shown in Figure 8-3). The title bar reflects the port that you are configuring (A or B).

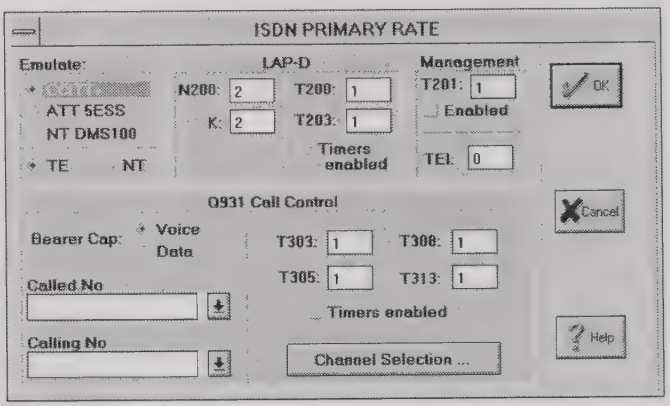


Figure 8-3
The ISDN Primary Rate Dialog Box

The choices that are available to you in the ISDN Primary Rate dialog box are described in Table 8-4.

Table 8-4
ISDN Primary Rate Dialog Box Choices

The Emulate Choice:	Lets You Do the Following:
CCITT	Emulate the CCITT-standard for ISDN Primary Rate equipment.
ATT5ESS	Emulate the AT&T-standard for ISDN Primary Rate equipment.
NT DMS100	Emulate the Northern Telecom-standard for ISDN Primary Rate equipment.
TE	Emulate Terminating Equipment (TE) based on the standard specified (i.e., CCITT, AT&T, or Northern Telecom).
NT	Emulate Network Termination (NT) equipment based on the standard specified (i.e., CCITT, AT&T, or Northern Telecom).
The LAP-D Choice:	**Lets You Do the Following:**
N200	Enter the maximum number of retransmissions, within the range 1-100.
K	Enter the maximum number of outstanding I-frames, within the range 1-127.
T200	Set the Acknowledgment timer to a value within the range 1-120 seconds.
T203	Set the Link Idle timer to a value within the range 1-120 seconds.
Timers enabled	Enables (via check mark) or disables (no check mark) the T200 and T203 timers.
The Management Choice:	**Lets You Do the Following:**
T201	Enter the timer value for TEI Audit Retry, within the range 1-120.
Enabled	Enables (via check mark) or disables (no check mark) the T201 timer.
TEI	Enter the value 0. Although this parameter is always selectable, it is only available when NT emulation is specified.

Table 8-4
ISDN Primary Rate Dialog Box Choices (Continued)

The Q.931 Call Control Choice:	Lets You Do the Following:
Bearer Cap	Select a circuit-switched VOICE call or a circuit-switched DATA call.
Called No.	Enter the number of the device you want to call, to a maximum of 16 digits. Note that only numeric characters, the asterisk (*), and the pound sign (#) are accepted as entries in this box. Also note that if you generate an auto-call (an activity choice in the Action menu), the called number that you specify will be dialed automatically.
Calling No.	Enter the X.121 calling number (i.e., address) of the FIREBERD 300/500, to a maximum of 16 digits. Note that only numeric characters, the asterisk (*), and the pound sign (#) are accepted as entries in this box.
T303	Enter a Set-up timer value within the range 1-120.
T305	Enter a Disconnect timer value within the range 1-120.
T308	Enter a Release timer value within the range 1-120.
T310	Enter a Call Proceeding timer value within the range 1-120.
T313	Enter a Connect timer value within the range 1-120.
Channel Selection	Display the T1 ISDN Primary Rate Configuration dialog box, which allows you to select a D channel and a B channel from the 24 channels available in the ISDN Primary Rate (T1). In ISDN emulation, the D channel is used to send set-up messages, including B channel numbering information. Once a call is set up, data is transmitted on the B channel. The T1 ISDN Primary Rate Configuration dialog box is also used to specify a channel rate of 56 kbps or 64 kbps.

8.5.4 Starting and Stopping ISDN Emulation

Once you have configured the WAN Analyzer for ISDN emulation, ISDN Emulation:Startingyou are ready to start the Task, as follows:

1. Click on `Action`
2. Select `Run` from the open menu.

   RESULT: If the WAN Analyzer is not currently active, a message invites you to start the WAN board: Click on `Yes`.

After you start the WAN board, the activities in the Action box are no longer grayed out, and are available to you. Note that Send Inservice, Send Maintenance, and Send Out of Service are only available when ATT 5ESS or NT DMS100 are selected as the emulation standard.

When you are ready to stop the ISDN Primary Rate Emulation Task:

1. Click on `Action`
2. Select `Halt`from the open menu.

8.5.5 Initiating or Accepting a Call

Initiating a Call

To initiate an interactive ISDN call, do the following:

1. Click on `Action`
2. Select `Initiate/Accept Call` from the open menu.

   RESULT: The ISDN DIALING dialog box appears on the display.

3. Enter the number of the device you want to call in the box provided, to a maximum of 16 digits. Note that only numeric characters, the asterisk (*), and the pound sign (#) are accepted as entries.

4. After you have entered the number of the device you want to call, click on OK .

   RESULT: Immediately after clicking on OK :

   - The VOICE box indicates a status of Ringing.
   - The DIAL box shows the number of the device that you are calling.
   - The Q931 box indicates Establish Wait.
   - The LAPD box indicates 5 Awaiting Establ.

   With the exception of the number in the DIAL box, these states will change as the connection is established.

The ability to initiate a call is available to you as long as no other device has initiated an incoming call to the WAN Analyzer.

Accepting an Incoming Call

The Emulation Task also gives you the ability to accept calls from other devices. When an incoming call to the WAN Analyzer has been initiated by a calling device:

- The VOICE box indicates Ringback.
- The Q931 box indicates In Call Proceed.

To accept an incoming call, do the following:

1. Click on Actions
2. Select Initiate/Accept Call from the open menu.

8.5.6 Initiating an Auto-Call

To automatically initiate a call to the CALLED number that you specified in the ISDN Primary Rate Configuration dialog box, do the following:

1. Click on Actions

2. Select `Initiate Auto Cal` from the open menu.

   RESULT: Immediately after clicking on `OK` :

   - The VOICE box indicates a status of Ringing.
   - The DIAL box shows the number of the device that you are calling.
   - The Q931 box indicates Establish Wait.
   - The LAPD box indicates 5 Awaiting Establ.

   With the exception of the number in the DIAL box, these states will change as the connection is established.

8.5.7 Terminating an Established Connection or Rejecting an Incoming Call

To terminate an established connection or reject an incoming call, do the following:

1. Click on `Actions`
2. Select `Hangup Call` from the open menu.

8.5.8 Restarting the Interface

The Emulation Task gives you the ability to send a restart message, which will return the channel and interface to an IDLE condition. This message is usually sent when the other side of the connection does not respond to other call control messages.

To restart the channel connection, do the following:

1. Click on `Actions`
2. Select `Restart Interface` from the open menu.

   RESULT: All status boxes indicate a return to the IDLE state.

8.5.9 Sending an In-Service Message

An in-service message is used to return a channel to operation when it has been taken out-of-service or placed on maintenance status. The return to in-service status occurs when the two devices at either end of the interface exchange Service and Service Acknowledge messages.

To send an in-service message, do the following:

1. Click on `Actions`
2. Select `Send Inservic` from the open menu.

Note that Send Inservice is not available (i.e., grayed out) when CCITT is selected as the emulation standard.

8.5.10 Sending a Maintenance Message

A maintenance message is used to place a channel on maintenance status. In such instances, the channel may not be used to send or receive normal outgoing traffic.

To send a maintenance message, do the following:

1. Click on `Actions`
2. Select `Send Maintenance` from the open menu.

Note that Send Maintenance is not available (i.e., grayed out) when CCITT is selected as the emulation standard.

8.5.11 Sending an Out-of-Service Message

An out-of-service message is used to place a channel or interface on out-of-service status. In such instances, the channel or interface may not be used to send or receive normal outgoing traffic.

To send an out-of-service message, do the following:

1. Click on `Actions`
2. Select `Send Out of Servic` from the open menu.

Note that Send Out of Service is not available (i.e., grayed out) when CCITT is selected as the emulation standard.

8.5.12 Sending a TEI Audit

To send a TEI audit message, do the following:

1. Click on `Actions`
2. Select `Send TEI Audi` from the open menu.

8.5.13 General Procedure for ISDN Primary Rate Emulation

Here is the general procedure for emulating the ISDN Primary Rate with the WAN Analyzer. Note that these steps assume that you've already entered the Emulation Task.

1. Click on `Setup`.
2. Select `ISDN` from the open menu.

   RESULT: The ISDN Primary Rate dialog box appears on the display.
3. Use the ISDN Primary Rate dialog box to configure the WAN Analyzer for the Emulation Task you want to perform. The individual components of the dialog box are described in Table 8-4.
4. When you have configured the ISDN Primary Rate dialog box based on the Emulation Task you want to perform, click on `OK` .

   NOTE: Before starting the Emulation Task, as described in Steps 5 and 6, open and tile the Display Task so that you can verify the information that you're about to send and receive.
5. Click on `Actions`
6. Select `Run` from the open menu.

   RESULT: If the WAN Analyzer is not active, a message invites you to start the WAN board. Click on `Yes`.
7. Click on `Actions`
8. Select the activity you want to initiate from the open menu.
9. Observe the state changes in the status boxes, as well as the information that you've transmitted and received in the Display Task.
10. Repeat Steps 8 and 9 until you are ready to end the Emulation Task.
11. Click on `Actions`
12. Select `Halt`from the open menu.

8.5.14 ISDN Emulation Icons

The toolbar offers ten icons that are specific to the ISDN emulation Task, as follows:

Icon:	Description:
	Enables you to start the ISDN emulation Task. This icon is identical in function to selecting `Run` from the Actions menu.
	Enables you to stop the ISDN emulation Task. This icon is identical in function to selecting `Halt` from the Actions menu.
	Enables you to initiate or accept an interactive call. This icon is identical in function to selecting `Initiate/Accept Cal` from the Actions menu.
	Enables you to initiate an auto-call. This icon is identical in function to selecting `Initiate Auto Cal` from the Actions menu.
	Enables you to terminate an established connection. This icon is identical in function to selecting `Hangup Call` from the Actions menu.
	Enables you to restart a channel connection. This icon is identical in function to selecting `Restart Interfa` from the Actions menu.
	Enables you to send an in-service message. This icon is identical in function to selecting `Send Inservice` from the Actions menu.
	Enables you to send a maintenance message. This icon is identical in function to selecting `Send Maintenance` from the Actions menu.
	Enables you to send an out-of-service message. This icon is identical in function to selecting `Send Out-of-Servi` from the Actions menu.
	Enables you to send a TEI audit message. This icon is identical in function to selecting `Send TEI Audi` from the Actions menu.

8.6 FRAME RELAY EMULATION

8.6.1 What You Can Do in the Frame Relay Emulation Task

The Frame Relay Emulation Task enables you to do all of the following:

1. Configure the Frame Relay link for the type of Frame Relay emulation you want to perform.
2. Using Data Link Connection Identifiers (DLCIs), select the Permanent Virtual Circuits (PVCs) that you want to open and for which you want to display statistics.
3. Build frames that you can transmit to the device to which you have established a connection.
4. Display statistics on an entire Frame Relay link and as many as four individual PVCs.
5. Reset the Frame Relay link and/or PVC statistics.

8.6.2 When Entering the Frame Relay Emulation Task

When entering the Frame Relay Emulation Task (as described in Section 8.4), the Frame Relay screen (as shown in Figure 8-4) appears on the display.

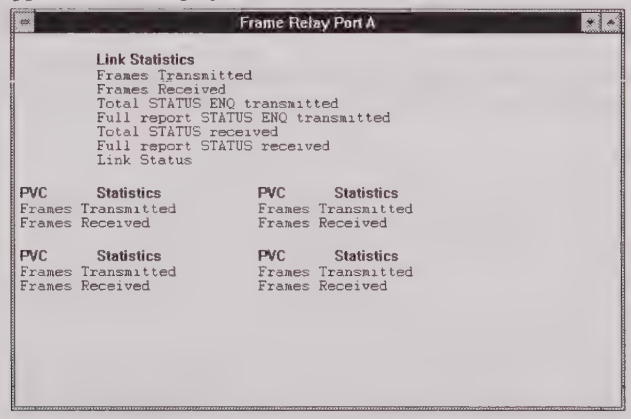


Figure 8-4
The Frame Relay Screen

As shown in Figure 8-4, the Frame Relay screen can display statistics for the entire Frame Relay link, and as many as four individual PVCs. In addition to the number of frames transmitted and received, the following link statistics are also available:

- `Status Enquiry (Enq)` tracks the number of polling message sent by the DTE to the DCE requesting its status (i.e., up or down).
- `Full Status Enquiry (Enq)` tracks the number of Full Status Enquiries sent by the DTE. A Full Status Enquiry is a signaling request which indicates that the DCE should include keep alive and PVC status information elements in its response.
- `Status Enquiry Response (Enq Resp)` tracks the number of Status frames received by the DTE in response to a Status Enquiry.
- `Full Status Response (Resp)` tracks the number of frames received by the DTE in response to a Full Status Enquiry.
- `Link Status` shows the current status of the Frame Relay Link.

All statistics are continually updated while Frame Relay emulation is in progress. Before starting the Emulation Task and viewing the changes in statistics, however, you must first configure the WAN Analyzer for Frame Relay emulation. This activity is performed using the Frame Relay Emulation dialog box, which is described in detail in the section immediately following.

8.6.3 Configuring the WAN Analyzer for Frame Relay Emulation

Before starting the Emulation Task, you must configure the WAN Analyzer for Frame Relay emulation, based on the specifics of the application. You can specify all of the configuration requirements in the Frame Relay Emulation dialog box.

To display the Frame Relay Emulation dialog box, do the following:

1. Click on `Setup`.
2. Select `Frame Relay Link` from the open menu.

   RESULT: The Frame Relay Emulation dialog box appears on the screen (as shown in Figure 8-5). The title bar reflects the port that you are configuring (A or B).

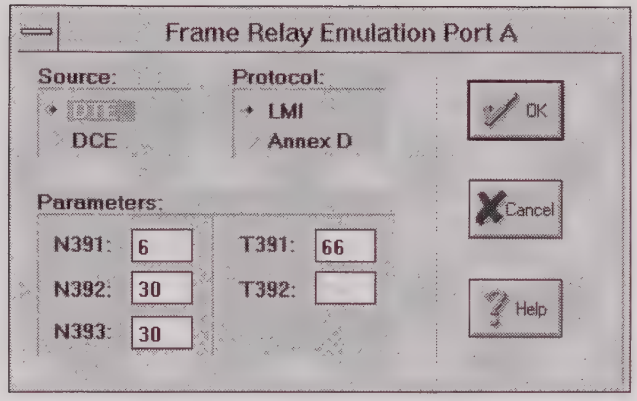


Figure 8-5
The Frame Relay Emulation Dialog Box

The choices that are available to you in the Frame Relay Emulation dialog box are described in Table 8-5.

Table 8-5
Frame Relay Emulation Dialog Box Choices

The Source Choice:	Lets You Do the Following:
DTE	Emulate a DTE (i.e., a user device). When emulating a DTE, the WAN Analyzer sends a Status Enquiry to obtain the link status of the DCE.
DCE	Emulate a DCE (e.g., a switch).
LMI	Use the Local Management Interface (LMI;) in-channel signaling protocol. Developed in 1990, LMI is the original Frame Relay signaling protocol.
Annex D	Use the Annex D in-channel signaling protocol. Annex D is a part of the ANSI T1.617 standard.

Table 8-5
Frame Relay Emulation Dialog Box Choices (Continued)

The Parameter Choice:	Lets You Do the Following:
N391	Indicate how many Link Integrity Verification exchanges should occur before a Full Status request is sent. The allowed range is 1-300, with a default value of 6. Note that N391 is not available (i.e., grayed out) when DCE is the selected source.
N392	Indicate the number of errors required during a given measurement interval to generate an alarm. The allowed range is 1-300, with a default value of 3.
N393	Indicate the number of monitored events contained in the interval. The allowed range is 1-300, with a default value of 4.
T391	Indicate the number of seconds that can elapse between Link Integrity Verifications. The allowed range is 1-100, with a default value of 10. Note that T391 is not available (i.e., grayed out) when DCE is the selected source.
T392	Indicates the maximum number of seconds the DCE will wait to receive a Link Integrity Verification (from DTE) before declaring an error. Note that T392 is not available (i.e., grayed out) when DTE is the selected source.

8.6.4 Opening and Displaying PVCs

After configuring the WAN Analyzer for the Frame Relay emulation Task you want to perform, you can, if desired, choose to open and display statistics on individual PVCs. These PVCs are identified using the Data Link Connection Identifier (DLCI), a 10-bit header in the Frame Relay header. Note that up to 24 PVCs can be opened, and up to 4 PVCs can be displayed for statistics at any given time.

You can select the PVCs that you want to open and display using the PVC Selection dialog box.

To display the PVC Selection dialog box, do the PVC Selection Dialog Box following:

1. Click on `Actions`
2. Select `PVC Selection` from the open menu.

   RESULT: The PVC Selection dialog box appears on the screen (as shown in Figure 8-6). The title bar reflects the port that you are configuring (A or B).

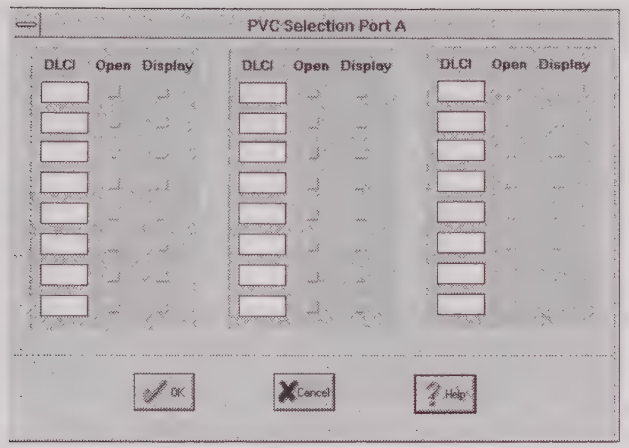


Figure 8-6
The PVC Selection Dialog Box

The choices that are available to you in the PVC Selection dialog box are described in Table 8-6.

Table 8-6
PVC Selection Dialog Box Choices

The Source Choice:	Lets You Do the Following:
DLCI	Enter the DLCI of the PVC you want to open or display. Note that DLCI 0 (used to indicate a signaling frame in Annex D) and DLCI 1023 (used to indicate a signaling frame in the LMI) cannot be entered.
Open	Open a PVC by placing a check in the appropriate box. Note that up to 24 PVCs can be open at any given time.

Table 8-6
PVC Selection Dialog Box Choices (Continued)

The Source Choice:	Lets You Do the Following:
Display	Display statistics on a PVC by placing a check in the appropriate box. When selected, the Frame Relay screen displays the number of frames transmitted and received for the PVCs you specified. You can display statistics for up to 4 PVCs at any given time; once you have selected four PVCs, the check box is removed from the remaining DLCIs in the dialog box. Note that, while Frame Relay emulation is in progress, you can: 1. Re-enter the dialog box. 2. Cancel the display of statistics for any currently selected DLCI by removing the check from the appropriate box. 3. Display statistics for a new DLCI by placing a check in the appropriate box. Also note that a DLCI must also be opened for statistics to be displayed.

Once you have completed this activity, you can build frames to send to each of the DLCIs that you have chosen to display. This activity is described in the section immediately following.

8.6.5 Building Frames

All frame building for Frame Relay emulation takes place in the Frame Relay Frame Builder dialog box. To enter this dialog box, do the following:

1. Click on `Setup`.
2. Select `Frame Builder` from the open menu.

   RESULT: The Frame Relay Frame Builder dialog box (as shown in Figure 8-7) appears on the display. Note that the title of the dialog box reflects the port on which you want to generate traffic (A or B).

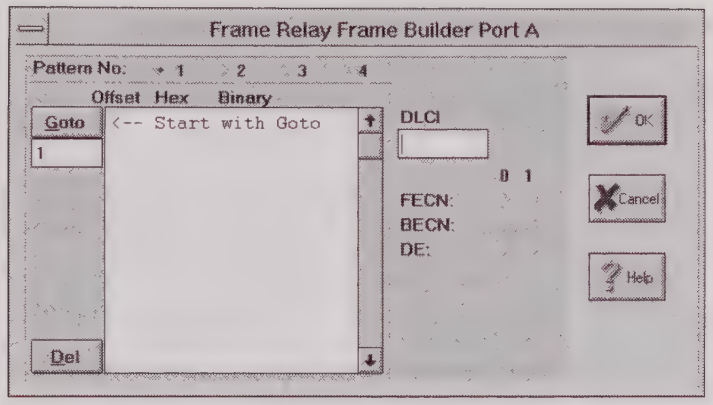


Figure 8-7
Sample Frame Relay Frame Builder Dialog Box

Basic Rules For Building Frames

The basic rules for frame building are as follows:

1. You can build as many as four different frames (one for each DLCI that you specified in the PVC Selection dialog box) in a single Frame Relay Frame Builder dialog box.

2. Each bit pattern within a frame consists of two or more individual octets (i.e., bytes). You may have a minimum of 2 overhead octets (Offsets 1 and 2, which are reserved for the Frame Relay address) and a maximum of 16,384 octets in a single frame.

3. The frame builder features bit helpers for the DLCI, and the Forward Explicit Congestion Notification (FECN), the Backward Explicit Congestion Notification (BECN), and the Discard Eligibility (DE) bits. Table 8-7 describes this feature in detail.

4. All bits in offsets reserved for data are set to zero (i.e., 00000000). You may change these bits to reflect any value that you desire.

The Components of the Frame Relay Frame Builder Dialog Box

As shown in the sample dialog box in Figure 8-6, the Frame Relay Builder dialog box has a number of individual components. Each component is described in Table 8-7.

Table 8-7
The Components of the Frame Relay Frame Builder Dialog Box

The Component:	Lets You Do the Following:
Pattern No.	Enter the number of the frame that you are creating. Click to place a dot in the appropriate diamond (1-4).
Pattern Editor	Create or edit any octet in a frame. The individual parts of the editing box are described from right to left, as follows: `Binary` enables you to manually create the individual values in the octet in the binary format. Use zeros and ones to fill in each bit position in the octet, as desired. Note that ones and zeros are the only values that are accepted in this field; place the cursor to the left of the bit position you want to work in, then use the keyboard to enter the appropriate character. Also note that as you change the bits in the octet, the Hex value automatically change to reflect its current hexadecimal value. `Hex` specifies the actual hexadecimal value of the current octet. To manually change this value, use the mouse to place the cursor to the left of the current value, then use the keyboard to enter the appropriate characters. Also note that as you change the value, the octet automatically reflects the new value as well. `Offset` is the sequence number assigned to any octet in a frame in relation to its position from flag. Note that, based on the link protocol you're working in, certain offsets are often reserved for specific information. For example, in Frame Relay, Offsets 1 and 2 are always reserved for the address, and are the two offsets closest to the flag.
Goto	Select a specific offset number. To edit an existing offset, simply enter the appropriate number in the box provided, then press the `Enter` key. If the offset number that you enter doesn't exist, then it will be created for you and placed in numerical sequence within the frame.
Del	Delete any offset (i.e., byte) in the bit pattern. To do this, simply place the cursor anywhere in the offset by clicking on the `Del` button.

Table 8-7
The Components of the Frame Relay Frame Builder Dialog Box (Continued)

The Component:	Lets You Do the Following:
Bit Helpers	Get help in matching key bit values, as follows: DLCI lets you enter the number of the DLCI that applies to a PVC for which you want to display statistics. This number should match at least one of the DLCIs you chose to display in the PVC Selection dialog box. When entered, note that the binary and hexadecimal values of Offsets 1 and 2 change to reflect the new value. FECN lets you set the value of the FECN bit to 0 or 1. The FECN bit notifies the user that congestion-avoidance procedures should be initiated for traffic in the same direction as the received frame. A value of one indicates that such congestion has been encountered. When a new value is entered, note that the binary and hexadecimal values of the FECN bit in Offset 2 change to reflect that value. Note that the default is zero. BECN lets you set the value of the BECN bit to 0 or 1. The BECN bit notifies the user that congestion-avoidance procedures should be initiated for traffic in the opposite direction of the received frame. A value of 1 indicates that such congestion may be encountered. When a new value is entered, note that the binary and hexadecimal values of the BECN bit in Offset 2 change to reflect that value. Note that the default is 0. DE lets you set the value of the DE bit to 0 or 1. When set to a value of one, the DE bit indicates to the network that the frame can be discarded first if congestion occurs. When a new value is entered, note that the binary and hexadecimal values of the DE bit in Offset 2 change to reflect that value. Note that the default is zero.
OK	Save the Frame Relay Frame Builder dialog box and return to the Frame Relay screen.
Cancel	Cancel the latest entries in the Frame Relay Frame Builder dialog box and return to the Frame Relay screen.

After you have built the frames for the Frame Relay Emulation Task you want to perform, you should be ready to start the activity.

8.6.6 Starting and Stopping Frame Relay Emulation

To start the Frame Relay Emulation Task, do the following:

1. Click on `Actions`
2. Select `Run` from the open menu.

   RESULT: If the WAN Analyzer is not currently active, a message invites you to start the WAN board. Click on `Yes`.

After you start the WAN board, the Reset Status and Frame Tx activities (listed under the Actions menu) are available to you.

When you are ready to stop the Frame Relay Emulation Task:

1. Click on `Actions`
2. Select `Halt` from the open menu.

8.6.7 Resetting Statistics

To reset the values of the link and/or PVC statistics Resetting Statistics to zero, do the following:

1. Click on `Actions`
2. Select `Reset Status` from the open menu.

   RESULT: The Reset Statistics dialog box appears on the display.

3. Place a check mark in the box to the left of the appropriate box to reset the link statistics, the PVC statistics, or both.

   RESULT: The statistics you specified are reset to zero on the Frame Relay screen.

8.6.8 Transmitting a Frame

At any time during Frame Relay emulation, you have the ability to transmit a frame to a PVC. Note that the frame that will be transmitted is the currently selected PATTERN in the Frame Relay Frame Builder dialog box (1, 2, 3, or 4).

To transmit a frame to a PVC, do the following:

1. Click on `Actions`
2. Select `Frame Tx` from the open menu.

   RESULT: The Frames Received count of the PVC to which you transmitted the frame should increase by one. When the PVC responds, the Frames Transmitted count should also increase by one.

If desired, you can also open and tile the Display Task to view the actual frames that were transmitted and received by the WAN Analyzer.

3. Place a check mark in the box to the left of the appropriate box to reset the link statistics, the PVC statistics, or both.

   RESULT: The statistics you specified are reset to zero on the Frame Relay screen.

8.6.9 General Procedure For Frame Relay Emulation

Here is the general procedure for emulating Frame with the WAN Analyzer. Note that these steps assume that you've already entered the Emulation Task.

1. Click on `Setup`.
2. Select `Frame Relay Link` from the open menu.

   RESULT: The Frame Relay Emulation dialog box appears on the display.

3. Use the Frame Relay Emulation dialog box to configure the WAN Analyzer for the Emulation Task you want to perform. The individual components of the dialog box are described in Table 8-6.
4. When you have configured the Frame Relay Emulation dialog box based on the Emulation Task you want to perform, click on `OK` .
5. Click on `Actions`

6. Select `PVC Selection` from the open menu.

   RESULT: The PVC Selection dialog box appears on the display.

7. Enter the number of the DLCI associated with the PVC you want to open and (if desired) display, then place a check mark in the appropriate boxes (i.e., Open and Display).

8. When you have selected the PVCs, click on `OK` .

9. Click on `Setup`.

10. Select `Frame Builder` from the open menu.

    RESULT: The Frame Relay Frame Builder dialog box appears on the display.

11. Build frames for each of the DLCIs that you have chosen to display.

12. When you have finished building the frames, click on `OK` .

13. Click on `Actions`

14. Select `Run` to start the Emulation Task.

8.6.10 Frame Relay Emulation Icons

The toolbar offers five icons that are specific to the Frame Relay Emulation Task, as follows:

Icon:	Description:
	Enables you to start the Frame Relay Emulation Task. This icon is identical in function to selecting `Run` from the Actions menu.
	Enables you to stop the Frame Relay Emulation Task. This icon is identical in function to selecting `Halt` from the Actions menu.
	Enables you to display the PVC Selection dialog box. This icon is identical in function to selecting `PVC Selection` from the Actions menu.
	Enables you to display the Reset Statistics dialog box. This icon is identical in function to selecting `Reset Status` from the Actions menu.
	Enables you to transmit a frame. This icon is identical in function to selecting `Frame Tx` from the Actions menu.

Index

A

Actions box 4-10

Addr box 4-18

AND gate 4-8

ASCII Display Format 5-16

Auto-call 8-5

B

BECN 8-23

Bit Patterns
- creating 4-15

C

Capture Buffer 5-9

Capture Mode Setup Dialog Box
- choices 2-6

Capture Task 4-1, 4-4
- unable to select 4-3

Cascade 3-6, 4-4, 6-7

Close All 3-8

Contents Match Dialog Box 4-14, 4-16, 4-18

Contents matching 4-14

D

Display Format Dialog Box 5-15

Display Screen
- opening a second screen 5-4

Display Task 5-1
- activity summary 5-2
- before running 5-1
- entering 5-2
- formats 5-15
- icons 5-19
- if not selectable 5-3
- post-capture filtering 5-11
- time deltas 5-14

DLCIs 8-17

E

Emulation Task
- entering 8-3
- overview 8-1
- T1/data access requirements 8-2
- unable to select 8-4

Event Filter 4-7

Expanded Display Format 5-16

F

FECN 8-23

Filters
- post-capture 1-3
- pre-capture 1-3

Frame Builder Dialog Box 7-5
- components 7-6

Frame Relay Emulation 8-17
- dialog box 8-18
- entering 8-17
- icons 8-29
- starting 8-26
- stopping 8-26
- transmitting a frame 8-27

Frame Relay Frame Builder Dialog Box 8-22

Frame Relay Statistics 6-3

Freeze Buffer 5-6
- allocating memory 5-8
- disabling 5-8
- updating 5-7

H

Hexadecimal Display Format 5-17

I

IDLE Condition 8-13

In-service Message 8-13

Information Line 3-15

ISDN Emulation
- accepting an incoming call 8-12
- capabilities 8-5
- entering 8-6
- general procedure 8-15
- icons 8-16
- initiating a call 8-11
- initiating an auto-call 8-12
- starting 8-11
- stopping 8-11
- terminating an established connection 8-13

ISDN Primary Rate Dialog Box 8-8

L

Link Protocol Selection 8-3

M

Maintenance Message 8-14

N

New Frame Filter 4-13

New Test 3-17

NRZI 2-10

O

Offsets 8-23

Out-of-Service Message 8-14

P

Pass All 4-2

Post-Capture Filtering 5-11
- sample choices 5-14

Print Options 3-12
- analysis results 3-12
- port configuration 3-12
- user info notepad 3-12

Protocol Decodes 5-10
- list of available suites 5-21
- selecting 5-10

PVC Selection Dialog Box 8-20

PVCs 8-17

R

Real-Time Window 5-5
- enabling or disabling 5-6

Resetting Statistics 8-26

Restart Message 8-13

S

Saving Test Configurations 3-8
- changing and saving a configuration under a new file 3-10
- changing and saving a configuration under the original file name 3-10
- entering configuration file information 3-12
- opening a previously saved configuration 3-11
- saving captured data to a file 3-11

Set Transmit Interval Dialog Box 7-8

"Spin" Button 4-27

Stack Templates 5-12
- dialog box 5-13

Starting a New Test 3-17

Starting a Test 3-8

Status 4-7

T

Task Menu 3-2

Task Summary 2-12

Tasks
- closing 3-8
- display by title 3-6
- displaying open tasks simultaneously 3-7

TEI audit message 8-14

Test Manager
- returning to 3-19

Test Type Choices 2-3

Tile 3-7

Time Deltas 5-14

Toolbar Icons 3-16
- main menu 3-16

Traffic Generation Task
- access requirements 7-2
- activities 7-1
- compared to emulation 7-2
- icons 7-12
- if not selectable 7-4
- tiling the display or statistics task 7-11

Traffic Generator Dialog Box 7-8
- components 7-9

U

User info 3-12

W

WAN Analyzer
- activities 1-3
- entering 2-3
- features 1-3
- getting started 2-1
- main menu 2-11
- selecting a task 3-3

WAN Initial Configuration Dialog Box 2-4

WAN Port Configuration Dialog Box 2-8
- choices 2-9

Telecommunications
Techniques
Corporation

TTC™
A Dynatech Company

Telecommunications Techniques Corporation
20400 Observation Drive, Germantown, Maryland 20876
Tel. (800) 638-2049 • (301) 353-1550 (MD) • FAX (301) 353-9216
WWW Address: http://www.ttc.com